01 ON BOARD DIAGNOSTIC (OBD)

ON BOARD DIAGNOSTIC (OBD)

On Board Diagnostic (OBD) Technical data

Features

- Data transfer between control module and vehicle diagnostic, testing and information system VAS 5051 is carried out in "self-diagnosis" mode.
- Diagnostic Trouble Code (DTC) memory: Non-volatile and volatile memories.
- Display of stored DTCs occurs after initiation of display mode. Refer to **Diagnostic Trouble Code (DTC) memory, checking** .
- DTC memory must be erased after malfunction is repaired. Refer to **Diagnostic Trouble Code (DTC) memory, erasing**.

Important

- Readiness code must be re-generated after every time DTC memory is erased. Refer to **Readiness code, generating** .
- If the ECM recognizes malfunctions that lead to a worsening of emissions values, it indicates them by lighting the Malfunction Indicator Lamp (MIL) -K83- in the instrument cluster. Significance of Malfunction Indicator Lamp (MIL) -K83-. Refer to **Malfunction Indicator Lamp (MIL) -K83- in instrument cluster**.
- Electronic Power Control (EPC) relevant malfunctions are also indicated in the instrument cluster by the warning lamp for Electronic Power Control (EPC warning lamp).

Malfunction Indicator Lamp (MIL) -K83- in instrument cluster

If the engine control module (ECM) detects malfunctions which result in deterioration of exhaust emissions, these malfunctions will be indicated by illumination of exhaust gas warning lamp.

After switching on the ignition the ECM switches on the Malfunction Indicator Lamp (MIL) -K83-. Shortly after starting the engine, the MIL goes out if the ECM does not detect a malfunction through a deterioration of the exhaust emissions, and if the ECM activation of the lamp is ok.

If DTCs which cause the exhaust emission to deteriorate are detected when operating the engine, the ECM switches on the MIL. (These DTCs are listed in the DTC table). At the same time, an entry is made in the ECM DTC memory.

When switched on, the MIL may flash or illuminate constantly. In any case the DTC memory must be checked. Refer to **Diagnostic Trouble Code (DTC) memory, checking**

Continuous illumination

A malfunction is present which causes deterioration of the exhaust emission. Check DTC memory for ECM or automatic transmission (if available).

If there is a drive problem or a customer concern and the MIL is not illuminated the DTC memory must be checked. DTCs which do not switch on the MIL immediately, but only after recognizing the malfunction after restarting the engine, can also be stored.

Flashing

A malfunction is present which under these driving conditions will cause damage to the Three Way Catalytic Converter (TWC) (e.g. misfiring). In this case driving may only continue at reduced power.

Malfunction Indicator Lamp (MIL) -K83- in instrument cluster, checking

Functional check on MIL

- ○ Switch ignition on.
- The Malfunction Indicator Lamp (MIL) -K83- for self-diagnosis must illuminate.
- ○ Start engine.
- Shortly after starting the engine the MIL goes out if no exhaust emission related DTC is stored in the DTC memory.

NOTE: **The switch-on signal for the MIL is transferred via CAN-bus to the instrument cluster by the ECM. Check the data exchange between ECM and other CAN-bus control modules. Refer to Data exchange, Motronic/ABS (CAN-bus), checking**

Safety precautions

Note the following points if testers and measuring instruments have to be used during a road test:

WARNING:

- **Always attach testers and measuring instruments to the back seat and have a second person operate them from there.**
- **If test equipment were operated from the front passenger seat, the person sitting there could be injured if the front passenger airbag were triggered in the event of an accident.**

VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions

Requirements

- Fuses for engine electronics OK

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

- Battery voltage at least 12.7 V
- Ground (GND) connections at engine and transmission OK.

Work sequence

- Switch ignition off.

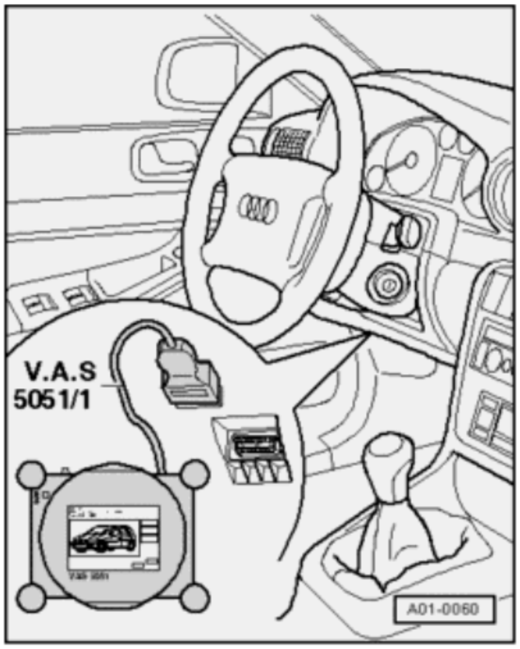

Fig. 1: Identifying Vehicle Diagnosis, Testing and Information System VAS 5051 and Data Link Connector (DLC)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect VAS 5051 with diagnostic wire VAS 5051/1.

WARNING:

- **For road tests, always secure VAS 5051 tester to rear seat and have operated from there by a second technician.**
- **Note the safety precautions. Refer to Safety precautions.**

NOTE: A malfunction message appears on the display:

Refer to Operating instructions of vehicle diagnostic, testing and information system VAS 5051

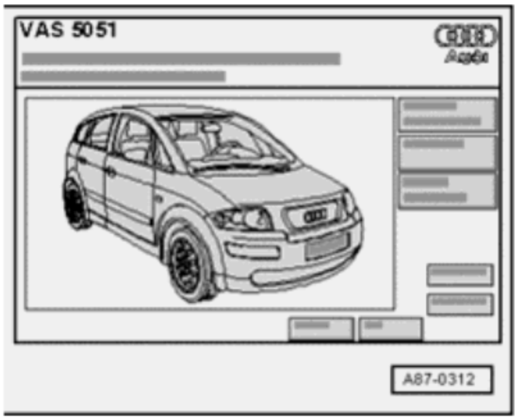

Fig. 2: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Press "vehicle self-diagnosis" button.

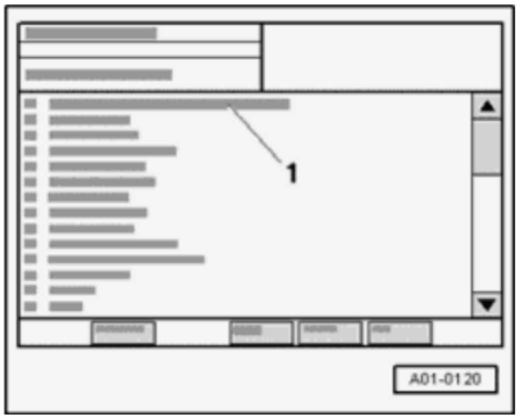

Fig. 3: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

NOTE: **The automatic test sequence is carried out by pressing "00 - Check Diagnostic Trouble Code (DTC) memory - Total system" in selection -1-, i.e. the Diagnostic Trouble Code (DTC) memories of all vehicle systems with self-diagnosis capability are checked.**

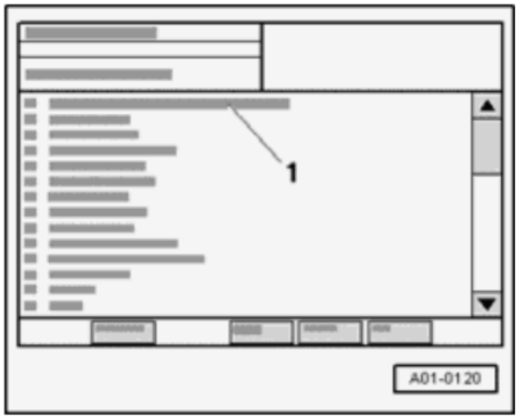

Fig. 4: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

Depending on which function is required. Refer to **Diagnostic Functions** :

- Switch ignition on.

or

- Start engine.
- Select vehicle system "01 - Engine electronics" in selection -1-.
- Wait until next display appears.

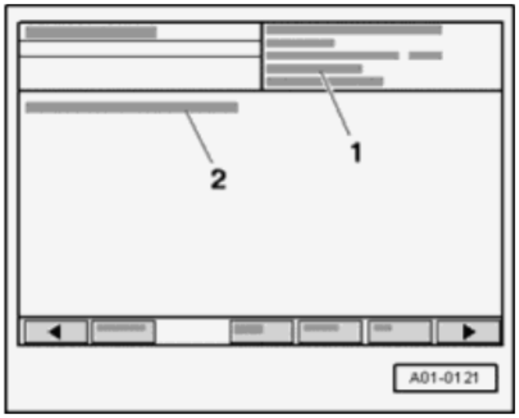

Fig. 5: VAS 5051 Tester Displaying Control Module Identification And Coding
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Control module identification of the Engine Control Module (ECM).

2 - Control module identification of the Immobilizer.

Control module identification Engine Control Module (ECM) (example)		
01 - Engine electronics	Vehicle system	
8E0909518..	Part-No.; assignment.	
1.8L 1) R4/5VT 2) G 3) 0003 4)	1) 2) 3) 4)	Engine capacity In line engine, 4 cylinders, 5 valves, turbo • G = cruise control system activated • No display = no cruise control system or cruise control system not activated Control module data status (software type)
Code 16501:	Code of control module (check. Refer to **EnCoding II Engine Control Module (ECM)**)	
Dealership No. 12345	Workshop code of VAS 5051 with which enCoding II was last performed	

Control module identification, Immobilizer (example)		
WAUXXX8EZ1A054321 1) AUZ7Z0X1137197 2)	1) 2)	17-digit vehicle identification no. (VIN) 14-digit ident no. for Immobilizer

- Press delta button.

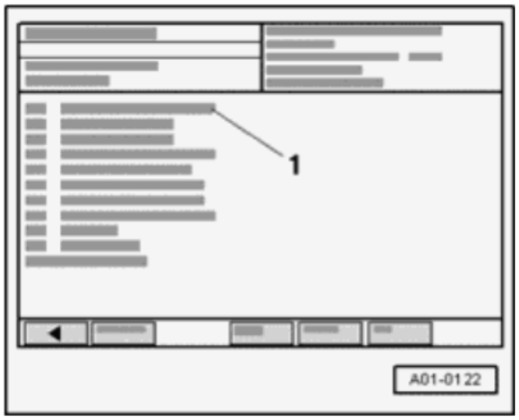

Fig. 6: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Selection of diagnostic functions:

Diagnostic Functions

Diagnostic functions		**Ignition on, engine stopped**	**Engine idling**	**Vehicle running**	Refer to
02	Interrogating Diagnostic Trouble Code (DTC) memory	No	yes	yes	Refer to **Diagnostic Trouble Code (DTC) memory, checking**
03	Output Diagnostic Test Mode (DTM)	yes	No	No	Refer to **Output Diagnostic Test Mode (DTM)**
04	Basic setting	No	yes	No	Refer to **Basic setting**
05	Erasing Diagnostic Trouble Code (DTC) memory	yes	yes	yes	Refer to **Diagnostic Trouble Code (DTC) memory, checking**
06	End of output	yes	yes	yes	Refer to **Ending output**
07	EnCoding II control module	yes	No	No	Refer to **EnCoding II Engine Control Module (ECM)**
08	Reading measured value block	yes	yes	yes	Refer to **Measured value block, reading**
09	Reading individual measured value	No	No	No	-
10	Adaptation	No	No	No	-
11	Coding II	yes	No	No	Refer to **Coding II**

DIAGNOSTIC TROUBLE CODE (DTC) MEMORY, CHECKING AND ERASING

Diagnostic Trouble Code (DTC) memory, checking

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection. Engine should be idling.

NOTE: If the engine will not start, crank it for at least 5 seconds with the starter and then always leave the ignition on.

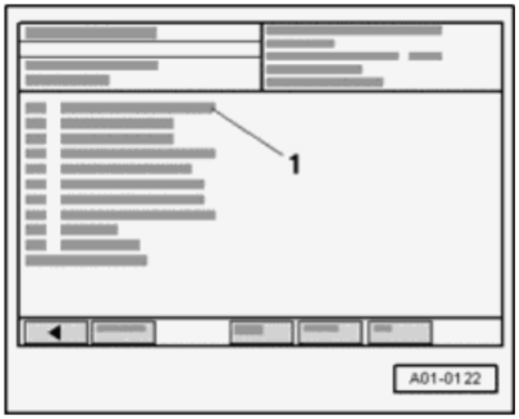

Fig. 7: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "02 - Check Diagnostic Trouble Code (DTC) memory".

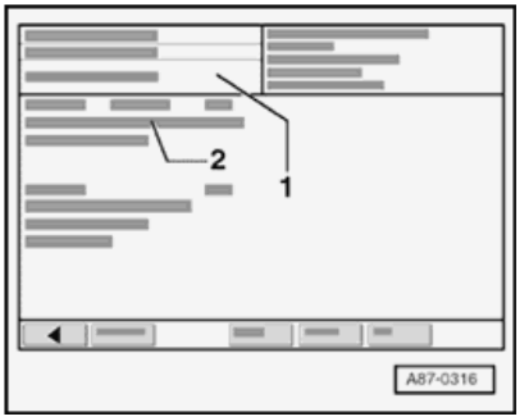

Fig. 8: Identifying Content Of DTC Memory & Identification Of Fault On Diagnostic System VAS 5051 Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Content of the Diagnostic Trouble Code (DTC) memory:

- 0 Faults recognized

or

- X Faults recognized

2 - DTCs

- DTC code

- DTC location
- DTC type

A - If malfunctions were recognized:

- Print out screen content or self-diagnosis report.
- Exit function "02 - Check Diagnostic Trouble Code (DTC) memory" by pressing <-- button.

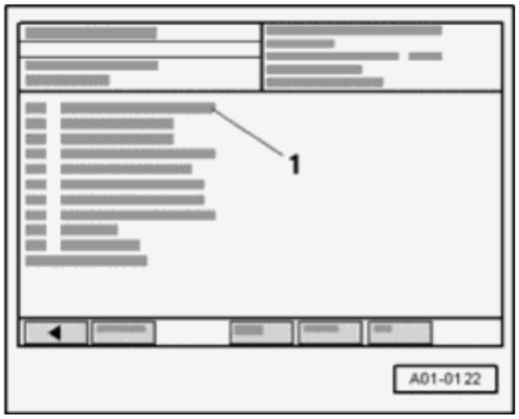

Fig. 9: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Repair malfunction(s) as specified in DTC table. Refer to **Diagnostic Trouble Codes (DTC): P0011 to P1228, VAG 16395 to 17636**.
- Reselect diagnostic function "02 - Check Diagnostic Trouble Code (DTC) memory" and erase DTC memory. Refer to **Diagnostic Trouble Code (DTC) memory, checking**.
- Select diagnostic function "06 - End output" in selection. Refer to **Ending output**.

B - If no malfunction was recognized:

- Select diagnostic function "06 - End output" in selection. Refer to **Ending output**.

Diagnostic Trouble Code (DTC) memory, erasing

NOTE: **If it is not possible to erase DTC memory, check it once again and repair malfunctions.**

Conditions

- Diagnostic Trouble Code (DTC) memory checked. Refer to **Diagnostic Trouble Code (DTC) memory, checking** .
- All malfunctions repaired.

After DTC memory has been successfully checked:

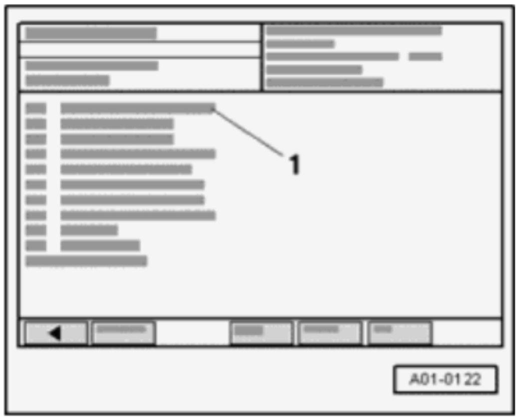

Fig. 10: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "05 - Erase Diagnostic Trouble Code (DTC) memory".

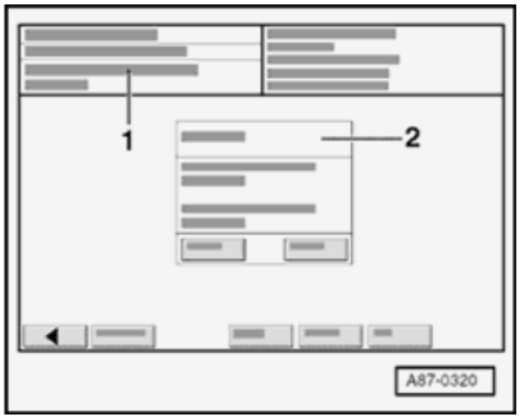

Fig. 11: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- 1 - No display (before erasing)

or

- Diagnostic Trouble Code (DTC) memory erased

NOTE: The following message appears in display zone -1-: "Diagnostic Trouble Code (DTC) memory not yet checked", if the operational sequence was not exactly performed. The Diagnostic Trouble Code (DTC) memory can only be erased, if

the Diagnostic Trouble Code (DTC) memory has been checked beforehand.

2 - Note: Is the function to be carried out?

Note: Data will be erased!

- Press -OK- button in display -2-.
- Exit function "05 - Erase Diagnostic Trouble Code (DTC) memory" by pressing <-- button.
- Check Diagnostic Trouble Code (DTC) memory again after performing repairs.

NOTE: **This erases malfunctions that have been stored while the malfunction was being repaired, for example, malfunctions that have arisen as a result of connectors being disconnected.**

Ending output

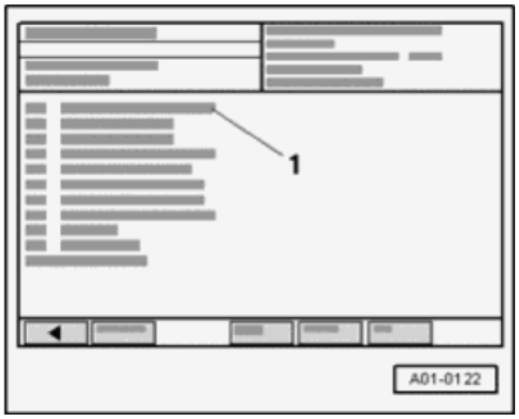

Fig. 12: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "06 - End output".

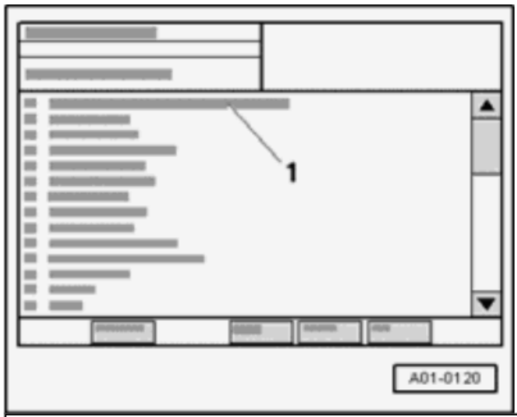

Fig. 13: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Switch off ignition when this display appears and disconnect diagnostic connector.

Diagnostic Trouble Code (DTC) Table

NOTE:

- **If malfunctions occur in the monitored sensors and components, these are stored in the Diagnostic Trouble Code (DTC) memory together with an indication of type of malfunction.**
- **Malfunctions related to EPC are additionally indicated by the warning lamp for the electronic throttle control ("EPC warning lamp") which is situated in the instrument cluster. Notes on EPC system. Refer to EPC system function.**
- **Malfunctions that worsen emissions are indicated by an exhaust warning lamp (MIL) that is also located in the instrument cluster. There are malfunctions that cause the exhaust warning lamp to light up immediately after recognition. Malfunctions can also occur that cause the exhaust MIL to light up, but only if malfunction is recognized again after repeated engine starts. Notes for exhaust warning lamp (MIL). Refer to Malfunction Indicator Lamp (MIL) -K83- in instrument cluster.**
- **Malfunctions which cause the exhaust emission to deteriorate are displayed with an exhaust warning lamp in the instrument cluster. Notes on exhaust warning lamp. Refer to Malfunction Indicator Lamp (MIL) -K83- in instrument cluster.**
- **The malfunction table is sorted according to the 5-digit DTC on the left.**
- **Sporadic malfunctions (malfunction occurring from time to time) are indicated as "sporadic" on the display. The word "sporadic" signifies individually occurring, random malfunctions.**
- **Do not immediately replace components indicated as faulty by the VAS 5051 but: first check the wiring and connectors of these components against the wiring diagram. Also check the ground (GND) connections against wiring diagram. This is particularly relevant for DTCs recorded as "sporadic."**
- **If the connector is pulled off the engine control module or if the battery is disconnected, all the stored values in the control module will be erased. However, the contents of the Diagnostic Trouble Code (DTC) memory are retained. If the engine is then started, it may run rough for a short period. In this case, the engine should be run at idle for a few minutes until the adaptation process is concluded.**
- **After erasing the Diagnostic Trouble Code (DTC) memory. Refer to Diagnostic Trouble Code (DTC) memory, checking the readiness code**

must be regenerated. Refer to Readiness code, generating.

Diagnostic Trouble Codes (DTC): P0011 to P1228, VAG 16395 to 17636

DTC code		DTC text	Corrective action
SAE	V.A.G		
P0011	16395	"A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	Refer to **15 - ENGINE - CYLINDER HEAD, VALVETRAIN**
P0012	16396	"A" Camshaft Position - Timing Over-Retarded Bank 1	
P0101	16485	Mass or Volume Air Flow Circuit Range/Performance	○ Check Mass Air Flow (MAF) sensor. Refer to **Fuel injectors, checking** ○ Check throttle valve for soiling. Refer to **Throttle valve, checking for soiling** ○ Check hose setup of crankcase ventilation for secure seating and for proper seal
P0102	16486	Mass or Volume Air Flow Circuit Low Input	
P0103	16487	Mass or Volume Air Flow Circuit High Input	
P0106	16490	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance 1)	Refer to **21 - TURBOCHARGER, G-CHARGER**

1) The intake manifold pressure is determined by the Charge Air Pressure Sensor -G31- (in place of displayed -G71-), the air pressure is determined by altitude sensor -F96- (in ECM).

DTC code		DTC text	Corrective action
SAE	V.A.G		
P0112	16496	Intake Air Temperature Sensor 1 Circuit Low	○ Check Intake Air Temperature (IAT) Sensor -G42-. Refer to **Intake Air**

			Temperature (IAT) sensor -G42-, checking.
P0113	16497	Intake Air Temperature Sensor 1 Circuit High	
P0116	16500	Engine Coolant Temperature Circuit Range/Performance	○ Check Engine Coolant Temperature (ECT) Sensor -G42-. Refer to **Engine Coolant Temperature (ECT) sensor -G62-, checking** ○ Check thermostat operation. Refer to **19 - ENGINE - COOLING SYSTEM**
P0117	16501	Engine Coolant Temperature Circuit Low	
P0118	16502	Engine Coolant Temperature Circuit High	
P0130	16514	O2 Sensor Circuit Bank 1 Sensor 1	○ Check Oxygen Sensor control. Refer to **Oxygen Sensor (O2S) and Oxygen Sensor control before catalytic converter, checking**
P0133	16517	O2 Sensor Circuit Slow Response Bank 1 Sensor 1	

DTC code		DTC text	Corrective action
SAE	V.A.G		
P0136	16520	O2 Sensor Circuit Bank 1 Sensor 2	○ Check Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC). Refer to **Oxygen Sensor (O2S) and Oxygen Sensor control**

			before Three Way Catalytic Converter (TWC), checking
P0137	16521	O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	
P0138	16522	O2 Sensor Circuit High Voltage Bank 1 Sensor 2	
P0139	16523	O2 Sensor Circuit Slow Response Bank 1 Sensor 2	
P0140	16524	O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	
P0230	16614	Fuel Pump Primary Circuit	○ Check Fuel Pump (FP) Relay -J17-. Refer to **Fuel Pump (FP) relay -J17- and relay activation, checking**
P0234	16618	Turbo/Super Charger Overboost Condition	Refer to **21 - TURBOCHARGER, G-CHARGER**
P0236	16620	Turbo/Super Charger Boost Sensor "A" Circuit Range/Performance	
P0237	16621	Turbo/Super Charger Boost Sensor "A" Circuit Low	
P0238	16622	Turbo/Super Charger Boost Sensor "A" Circuit High	
P0299	16683	Turbo/Super Charger Underboost	

DTC code		DTC text	Corrective action
SAE	V.A.G		
P0300	16684	Random/Multiple Cylinder Misfire Detected	○ Test misfire recognition. Refer to **Misfire recognition, checking** ○ Refuel vehicle ○ Check hose setup

			of crankcase ventilation for secure seating and for proper seal o Check injectors. Refer to **Fuel injectors, checking** o Check fuel pressure. Refer to **System pressure, fuel pressure regulator and residual pressure, checking**. o Test spark plugs and ignition wiring o Check ignition coils with power output stages. Refer to **Ignition coils with power output stages, checking** o Check secure fit and leak-tightness of crankcase breather hose connections
P0301	16685	Cylinder 1 Misfire Detected	
P0302	16686	Cylinder 2 Misfire Detected	
P0303	16687	Cylinder 3 Misfire Detected	
P0304	16688	Cylinder 4 Misfire Detected	
P0321	16705	Ignition/Distributor Engine Speed Input Circuit Range/Performance	o Check Engine Speed (RPM) Sensor -G28-. Refer to **Engine speed (RPM) sensor -G28-,**

			checking
P0322	16706	Ignition/Distributor Engine Speed Input Circuit No Signal	

DTC code		DTC text	Corrective action
SAE	V.A.G		
P0327	16711	Knock Sensor 1 Circuit Low Bank 1 or Single Sensor	○ Check KS -G61-. Refer to **Knock sensors, checking**
P0328	16712	Knock Sensor 1 Circuit High Bank 1 or Single Sensor	
P0332	16716	Knock Sensor 2 Circuit Low Bank 2	
P0333	16717	Knock Sensor 2 Circuit High Bank 2	
P0341	16725	Camshaft Position Sensor "A" Circuit Range/Performance Bank 1 or Single Sensor	○ Check Camshaft Position (CMP) Sensor -G40-. Refer to **Camshaft Position (CMP) sensor -G40-, checking**
P0342	16726	Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor	
P0343	16727	Camshaft Position Sensor "A" Circuit High Bank 1 or Single Sensor	
P0411	16795	Secondary Air Injection System Incorrect Flow Detected	○ Check Secondary Air Injection (AIR) system. Refer to **Intake air system for leaks (unmetered air), checking**. ○ Check Wastegate Bypass Regulator Valve -N75-: Refer to **21 - TURBOCHARGER, G-CHARGER**

DTC code		DTC text	Corrective action
SAE	V.A.G		
P0420	16804	Catalyst System	

		Efficiency Below Threshold Bank 1	○ Generate readiness code. Refer to **Readiness code, generating** . If same malfunction is indicated again, replace catalytic converter.
P0441	16825	Evaporative Emission System Incorrect Purge Flow	○ Check Evaporative Emission (EVAP) canister purge regulator valve -1-. Refer to **Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, checking**
P0442	16826	Evaporative Emission System Leak Detected (small leak)	○ Check fuel supply and tank ventilation system for leaks. Refer to **20 - FUEL SUPPLY SYSTEM**
P0455	16839	Evaporative Emission System Leak Detected (large leak)	
P0456	16840	Evaporative Emission System Leak Detected (very small leak)	
P0501	16885	Vehicle Speed Sensor "A" Range/Performance	○ Check CAN-Bus. Refer to **Data exchange, Motronic/ABS (CAN-bus), checking**
P0506	16890	Idle Air Control System RPM Lower Than Expected	○ Check throttle valve control module. Refer to **Throttle Valve Control Module -J338-, checking** ○ Perform adaptation of throttle valve control module. Refer to **Throttle**

			Valve Control Module -J338-, adapting ○ Check for unmetered air ○ Check hose setup of crankcase ventilation for secure seating and for proper seal ○ Check hose set-up (Secondary Air Injection (AIR) system and crankcase ventilation); check intake system for leaks (false air). Refer to **Intake air system for leaks (unmetered air), checking**
P0507	16891	Idle Air Control System RPM Higher Than Expected	

DTC code		DTC text	Corrective action
SAE	V.A.G		
P0420	16804	Catalyst System Efficiency Below Threshold Bank 1	○ Generate readiness code. Refer to **Readiness code, generating**. ○ If same malfunction is displayed again, replace Three Way Catalytic Converter (TWC).
P0441	16825	Evaporative Emission System Incorrect Purge Flow	○ Check Activating Evaporative Emission (EVAP) Canister Purge Regulator -N80-. Refer to **Evaporative Emission (EVAP) Canister Purge**

			Regulator Valve - N80-, checking
P0501	16885	Vehicle Speed Sensor "A" Range/Performance	○ Check vehicle speed signal . Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations
P0506	16890	Idle Air Control System RPM Lower Than Expected	○ Perform adaptation of Throttle Valve Control Module - J338-. Refer to **Throttle Valve Control Module - J338-, adapting** ○ Check for leaks (unmetered air) in intake air system. Refer to **Intake air system for leaks (unmetered air), checking** ○ Check hose setup of crankcase ventilation for secure seating and for proper seal ○ Check Secondary Air Injection (AIR) system. Refer to **Intake air system for leaks (unmetered air), checking**.
P0507	16891	Idle Air Control System RPM Higher Than Expected	
P0560	16944	System Voltage	○ Check voltage supply. Refer to **Motronic Engine Control Module (ECM) power supply, checking**
P0562	16946	System Voltage Low	
P0563	16947	System Voltage High	

DTC code		DTC text	Corrective action
SAE	V.A.G		
P0571	16955	Brake Switch "A" Circuit 2)	○ Check Brake Light Switch -F- and Brake Vacuum Vent Valve Switch -F47-. Refer to **Brake Light Switch -F- and Brake Pedal Switch -F47-**
P0601	16985	Internal Control Module Memory Check Sum Error	○ Replace Engine Control Module (ECM). Refer to **Removing Engine Control Module**
P0604	16988	Internal Control Module Random Access Memory (RAM) Error	
P0605	16989	Internal Control Module Read Only Memory (ROM) Error	
P0685	17069	ECM/PCM Power Relay Control Circuit/Open	○ Test Motronic ECM Power Supply Relay -J271-. Refer to **Motronic ECM Power supply relay -J271-, checking**
P0686	17070	ECM/PCM Power Relay Control Circuit Low	
P0687	17071	ECM/PCM Power Relay Control Circuit High	
P0688	17072	ECM/PCM Power Relay Sense Circuit/Open	
P1102	17510	HO2S Heater Control Circuit (Bank 1 Sensor 1) High	○ Check Oxygen Sensor (O2S) heating before Three Way Catalytic Converter (TWC). Refer to **Oxygen Sensor (O2S) and Oxygen Sensor control**

			before Three Way Catalytic Converter (TWC), checking
P1103	17511	Bank1-probe1, heating circuit output too low	

2) The brake pedal switch -F47- is monitored in addition to the brake light switch -F-.

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1105	17513	HO2S Heater Control Circuit (Bank 1 Sensor 2) High	○ Check Oxygen Sensor (O2S) heating after Three Way Catalytic Converter (TWC). Refer to **Oxygen Sensor (O2S) heater 1 -Z29- behind Three Way Catalytic Converter (TWC), checking**
P1111	17519	Oxygen sensor control (Bank 1) System too lean	○ Check oxygen sensor adaptation values and control ○ Check hose setup of crankcase ventilation for secure seating and for proper seal ○ Check Oxygen Sensor (O2S) control before Three Way Catalytic Converter (TWC). Refer to **Oxygen Sensor (O2S) and Oxygen Sensor control before Three Way Catalytic Converter (TWC), checking**

P1112	17520	Oxygen sensor control (Bank 1) System too rich	
P1114	17522	Bank 1, sensor 2 Internal resistance too large	○ Check Oxygen Sensor (O2S) heating after Three Way Catalytic Converter (TWC). Refer to **Oxygen Sensor (O2S) heater 1 -Z29- behind Three Way Catalytic Converter (TWC), checking** ○ Replace Oxygen Sensor (O2S) if resistance incorrect. Refer to **Oxygen Sensor (O2S), removing and installing**
P1115	17523	HO2S Heater Control Circuit (Bank 1 Sensor 1) Low	○ Check Oxygen Sensor (O2S) heating before Three Way Catalytic Converter (TWC). Refer to **Oxygen Sensor (O2S) and Oxygen Sensor control before Three Way Catalytic Converter (TWC), checking**
P1116	17524	HO2S Heater Control Circuit (Bank 1 Sensor 1)	

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1117	17525	HO2S Heater Control Circuit (Bank 1 Sensor 2) Low	○ Check Oxygen Sensor (O2S) heating after Three Way Catalytic Converter (TWC). Refer to **Oxygen**

			Sensor (O2S) heater 1 -Z29- behind Three Way Catalytic Converter (TWC), checking
P1118	17526	HO2S Heater Control Circuit (Bank 1 Sensor 2)	
P1127	17535	Bank1, mixture adaption (mult.) system too rich	○ Check hose set-up (Secondary Air Injection (AIR) system and crankcase ventilation) ○ Road test vehicle (fuel in oil) ○ Check fuel system pressure. Refer to **System pressure, fuel pressure regulator and residual pressure, checking** ○ Check Mass Air Flow (MAF) sensor -G70-. Refer to **Mass Air Flow (MAF) sensor -G70-, checking** ○ Check Secondary Air Injection (AIR) system. Refer to **Intake air system for leaks (unmetered air), checking**.
P1128	17536	Bank1, mixture adaption (mult.) system too lean	○ Check exhaust system for proper seal ○ Check pressure regulation valve of crankshaft housing ventilation

			○ Test Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). Refer to **Oxygen Sensor (O2S) and Oxygen Sensor control before Three Way Catalytic Converter (TWC), checking** ○ Test Oxygen Sensor (O2S) after Three Way Catalytic Converter (TWC). Refer to **Oxygen Sensor (O2S) heater 1 -Z29- behind Three Way Catalytic Converter (TWC), checking** ○ Check fuel injectors. Refer to **Fuel injectors, checking**

NOTE: **mult. = multiplicative means that the DTC occurs throughout the entire speed range and load range.**

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1136	17544	Bank1, mixture adaption (add.) system too lean	○ Check hose set-up (Secondary Air Injection (AIR) system and crankcase ventilation) ○ Perform road test (fuel in oil) ○ Check fuel system

			pressure. Refer to **System pressure, fuel pressure regulator and residual pressure, checking** ○ Check Mass Air Flow (MAF) sensor -G70-. Refer to **Mass Air Flow (MAF) sensor -G70-, checking** ○ Check for leaks (unmetered air) in intake air system. Refer to **Intake air system for leaks (unmetered air), checking**
P1137	17545	Bank1, mixture adaption (add.) system too rich	○ Test Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). Refer to **Oxygen Sensor (O2S) and Oxygen Sensor control before Three Way Catalytic Converter (TWC), checking** ○ Test Oxygen Sensor (O2S) after Three Way Catalytic Converter (TWC). Refer to **Oxygen Sensor (O2S) heater 1 -Z29- behind Three Way Catalytic Converter (TWC), checking** ○ Check fuel

			injectors. Refer to **Fuel injectors, checking** ○ Check exhaust system for proper seal ○ Check pressure regulation valve of crankshaft housing ventilation ○ Check Evaporative Emission (EVAP) Canister Purge Regulator -N80-. Refer to **Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, checking**

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1147	17555	Oxygen sensor control, Bank 2 System too lean	○ Check oxygen sensor adaptation values and control ○ Check hose setup of crankcase ventilation for secure seating and for proper seal
P1149	17557	Oxygen sensor control, Bank 1 Unplausible control value	○ Check Oxygen Sensor (O2S) learned values and Oxygen Sensor control. Refer to **Oxygen Sensor (O2S) and Oxygen Sensor control before catalytic converter, checking** ○ Check fuel system pressure. Refer to

			System pressure, fuel pressure regulator and residual pressure, checking ○ Check for leaks (unmetered air) in intake air system. Refer to **Intake air system for leaks (unmetered air), checking** ○ Check hose setup of crankcase ventilation for secure seating and for proper seal
P1150	17558	Oxygen sensor control, Bank 2 Unplausible control value	

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1171	17579	Angle sender 2 for throttle valve drive -G188- implausible signal	○ Test Angle sensor -2- for throttle drive -G188-. Refer to **Angle sensors -1- and -2- for throttle drive -G187- and -G188-, checking**
P1172	17580	Angle sender 2 for throttle valve drive -G188- signal too low	
P1173	17581	Angle sender 2 for throttle valve drive -G188- signal too high	
P1176	17584	Bank1, Lambda correction downstream of catalyst control limit reached	○ Check Oxygen Sensor aging of Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). Refer to **Oxygen**

			Sensor (O2S) before Three Way Catalytic Converter (TWC), checking ○ Check Oxygen Sensor (O2S) and Oxygen Sensor control after Three Way Catalytic Converter (TWC). Refer to **Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC), checking**
P1201	17609	Injector Circuit/Open Cylinder 1	○ Check fuel injectors. Refer to **Fuel injectors, checking**
P1202	17610	Injector Circuit/Open Cylinder 2	
P1203	17611	Injector Circuit/Open Cylinder 3	
P1204	17612	Injector Circuit/Open Cylinder 4	

NOTE: add. = additive means that DTC only has effect during idling

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1213	17621	Cylinder 1 Injector Circuit High	○ Check fuel injectors. Refer to **Fuel injectors, checking**
P1214	17622	Cylinder 2 Injector Circuit High	
P1215	17623	Cylinder 3 Injector Circuit High	
P1216	17624	Cylinder 4 Injector Circuit High	
P1225	17633	Cylinder 1 Injector Circuit Low	

P1226	17634	Cylinder 2 Injector Circuit Low	
P1227	17635	Cylinder 3 Injector Circuit Low	
P1228	17636	Cylinder 4 Injector Circuit Low	

Diagnostic Trouble Codes (DTC): P1237 to P3081, VAG 17645 to 18339

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1237	17645	Cylinder 1 injector -N30- open circuit	○ Check fuel injectors. Refer to **Fuel injectors, checking**
P1238	17646	Cylinder 2 injector -N31- open circuit	
P1239	17647	Cylinder 3 injector -N32- open circuit	
P1240	17648	Cylinder 4 injector -N33- open circuit	
P1250	17658	Fuel level too low	○ Follow-on DTC. Refer to Note (below) ○ Refuel vehicle, erase Diagnostic Trouble Code (DTC) memory ○ Check Diagnostic Trouble Code (DTC) memory of instrument cluster

NOTE: **The DTC "Fuel level too low" is stored only in conjunction with misfiring or DTCs concerning Oxygen Sensor (O2S) control if too little fuel is or was in the tank. The DTC is stored in the control module as static DTC and is not set as a sporadic DTC even if the vehicle is refuelled in the meantime.**

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1287	17695	Turbocharger divert air valve -N249- open circuit	. Refer to **21 - TURBOCHARGER, G-CHARGER**

P1288	17696	Recirculating valve for turbocharger -N249- Short circuit B+	
P1289	17697	Recirculating valve for turbocharger -N249- Short circuit Ground (GND)	
P1290	17698	Engine Coolant Temperature (ECT) Sensor (on radiator) - G83- Signal too large	. Refer to **21 - TURBOCHARGER, G-CHARGER**
P1291	17699	Engine Coolant Temperature (ECT) Sensor (on radiator) - G83- Signal too small	

DTC code		**DTC text**	**Corrective action**
SAE	V.A.G		
P1292	17700	Map Controlled Engine Cooling Thermostat - F265- Open circuit	. Refer to **19 - ENGINE - COOLING SYSTEM**
P1293	17701	Map Controlled Engine Cooling Thermostat - F265- Short circuit to B+	
P1294	17702	Map Controlled Engine Cooling Thermostat - F265- Short circuit to Ground (GND)	
P1296	17704	Malfunction in cooling system	
P1297	17705	Connection charger-throttle valve Pressure drop	○ Check throttle valve for soiling. Refer to **Throttle valve, checking for soiling**.
P1298	17706	Engine Coolant Temperature (ECT) Sensor (on Radiator) - G83- Unplausible signal	. Refer to **19 - ENGINE - COOLING SYSTEM**

DTC code		**DTC text**	**Corrective action**
SAE	V.A.G		
P1325	17733	Knock control - cylinder 1 control limit reached	○ Check knock control. Refer to

			Knock recognition control limit, checking
P1326	17734	Knock control - cylinder 2 control limit reached	
P1327	17735	Knock control - cylinder 3 control limit reached	
P1328	17736	Knock control - cylinder 4 control limit reached	
P1335	17743	Engine torque monitoring 2 Value above upper control limit	○ Large leak, check Intake Air Temperature (IAT) sensor. Refer to **Intake Air Temperature (IAT) sensor -G42-, checking** ○ Check Mass Air Flow (MAF) Sensor -G70-. Refer to **Mass Air Flow (MAF) sensor -G70-, checking** ○ Check Engine Coolant Temperature (ECT) Sensor -G62-. Refer to **Engine Coolant Temperature (ECT) sensor -G62-, checking**
P1336	17744	Engine torque monitoring value above upper control limit	

DTC code		**DTC text**	**Corrective action**
SAE	V.A.G		
P1340	17748	Camshaft Position Sensor-G40-, Engine Speed Sensor-G28- incorrect allocation	○ Remove Camshaft Position (CMP) Sensor -G40- and check whether rotor trim is mounted properly at camshaft. (If mounted improperly, locking lug

			will be damaged when mounting bolt is tightened). ○ Check engine timing. Refer to **13 - ENGINE - CRANKSHAFT, CYLINDER BLOCK**
P1355	17763	Ignition activation cylinder 1 Open circuit	○ Check ignition coils with power output stages. Refer to **Ignition coils with power output stages, checking**
P1356	17764	Ignition activation cylinder 1 Short circuit to B+	
P1357	17765	Ignition activation cylinder 1 Short circuit to Ground (GND)	
P1358	17766	Ignition activation cylinder 2 Open circuit	

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1359	17767	Ignition activation cylinder 2 Short circuit to B+	○ Check ignition coils with power output stages. Refer to **Ignition coils with power output stages, checking**
P1360	17768	Ignition activation cylinder 2 Short circuit to Ground (GND)	
P1361	17769	Ignition activation cylinder 3 Open circuit	
P1362	17770	Ignition activation cylinder 3 Short circuit to B+	
P1363	17771	Ignition activation cylinder 3 Short circuit to Ground (GND)	
P1364	17772	Ignition activation cylinder 4 Open circuit	

P1365	17773	Ignition activation cylinder 4 Short circuit to B+	
P1366	17774	Ignition activation cylinder 4 Short circuit to Ground (GND)	

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1386	17794	Internal Control Module Memory Check Sum Error	○ Replace Engine Control Module. Refer to **Engine Control Module (ECM) (without metal anti-theft housing), replacing**
P1387	17795	Internal Control Module Memory Check Sum Error	
P1388	17796	Internal Control Module Memory Check Sum Error	
P1410	17818	Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- Short circuit to B+	○ Check Evaporative Emission (EVAP) Canister Purge Regulator -N80-. Refer to **Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, checking**
P1421	17829	Secondary Air Injection (AIR) Solenoid Valve -N112- Short circuit to Ground (GND)	. Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS**
P1422	17830	Secondary Air Injection (AIR) Solenoid Valve -N112- Short circuit to B+	
P1424	17832	Bank1, secondary air system leak detected	
P1425	17833	Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-	○ Check Evaporative Emission (EVAP)

		Short circuit to Ground (GND)	Canister Purge Regulator -N80-. Refer to **Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, checking**
P1426	17834	Evaporative Emission System Pure Control Valve Circuit Open	

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1427	17835	Brake vacuum pump activation Short circuit to B+	Refer to **47 - BRAKES - HYDRAULIC COMPONENTS**
P1428	17836	Brake vacuum pump activation Short circuit to Ground (GND)	
P1429	17837	Activation of brake vacuum pump Open circuit	
P1432	17840	Secondary Air Injection System Switching Valve (A) Circuit Open	Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS**
P1433	17841	Secondary air pump relay -J299- open circuit	
P1434	17842	Secondary Air Injection (AIR) Pump Relay -J299- Short circuit to B+	
P1435	17843	Secondary Air Injection (AIR) Pump Relay -J299- Short circuit to Ground (GND)	

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1471	17879	EVAP Emission Control LPD Circuit Short circuit to B+	○ Perform tank leak diagnostic. Refer to **20 - FUEL SUPPLY SYSTEM**
P1472	17880	EVAP Emission Control	

		LPD Circuit Short circuit to Ground (GND)	
P1473	17881	Leak diagnosis pump - tank breather system open circuit	
P1475	17883	Leak diagnosis pump - tank breather system malfunction/no signal	
P1476	17884	Leak diagnosis pump - tank breather system malfunction/vacuum to low	

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1479	17887	Brake vacuum system Mechanical malfunction	○ If DTC 17887 is present: Perform short trip UP 28. Refer to **47 - BRAKES - HYDRAULIC COMPONENTS** ; Electric brake system vacuum pump, checking ○ If test is OK, clear fault, necessary repair is necessary
P1500	17908	Fuel Pump Primary Circuit Fault in electrical circuit	○ Check Fuel Pump (FP) Relay. Refer to **Fuel Pump (FP) relay -J17- and relay activation, checking**
P1501	17909	Fuel Pump (FP) Relays -J17- Short circuit to Ground (GND)	
P1502	17910	Fuel Pump (FP) Relay -J17- Short circuit to B+	
P1517	17925	Main relay -J271- Electrical fault in circuit	○ Test Motronic ECM Power Supply Relay -J271-. Refer to **Motronic ECM Power supply relay -J271-, checking**
P1523	17931	Crash signal from airbag control module	○ Check airbag system Diagnostic Trouble

		Unplausible signal 3)	Code (DTC) memory ○ Check CAN-bus. Refer to **Data exchange, Motronic/ABS (CAN-bus), checking**

3) The DTC is stored with the relevant signal from airbag control module.

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1529	17937	Intake camshaft control circuit Short circuit to B+	Refer to **15 - ENGINE - CYLINDER HEAD, VALVETRAIN**
P1530	17938	Intake camshaft control circuit	
P1531	17939	Intake camshaft control circuit Open circuit	
P1539	17947	Clutch Switch Input Circuit -F36- Unplausible signal	○ Check Clutch Vacuum Vent Valve Switch -F36-. Refer to **Clutch Vacuum Vent Valve Switch -F36-, checking**
P1541	17908	Fuel pump relay -J17- open circuit	○ Check Fuel Pump Relay -J17-. Refer to **Fuel Pump (FP) relay -J17- and relay activation, checking**
P1542	17950	Angle sender 1 for throttle valve drive -G187- implausible signal	○ Test Angle sensor -1- for throttle drive -G187-. Refer to **Angle sensors -1- and -2- for throttle drive -G187- and -G188-, checking**
P1543	17951	Angle sender 1 for throttle valve drive -G187- signal too low	
P1544	17952	Angle sender 1 for throttle valve drive -G187- signal too high	

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1545	17953	Throttle valve control system malfunction	○ Check Throttle Valve Control Module -J338-. Refer to **Throttle Valve Control Module -J338-, checking**
P1546	17954	Turbo/Super Charger Wastegate Solenoid (A) High Input/Short to B+	Refer to **21 - TURBOCHARGER, G-CHARGER**
P1547	17955	Turbo/Super Charger Wastegate Solenoid (A) Low Input/Short to ground	
P1548	17956	Solenoid valve for charge pressure control -N75- open circuit	
P1550	17958	Charge pressure control difference	
P1555	17963	Value above maximum charge pressure	
P1556	17964	Turbo/Super Charger Boost Sensor (A) Circuit Control limit not reached	
P1557	17965	Turbo/Super Charger Overboost Condition Control limit exceeded	

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1558	17966	Throttle valve drive -G186- electrical fault in circuit	○ Check Throttle Valve Control Module -J338-. Refer to **Throttle Valve Control Module -J338-, checking**
P1559	17967	Throttle Valve Control Module -J338- Fault in basic settings	○ Perform adaptation. Refer to **Throttle Valve Control Module -J338-, adapting**
P1560	17968	Engine Overspeed	○ Repair mechanical

		Condition	damage
P1564	17972	Throttle Valve Control Module -J338- insufficient voltage during basic settings	○ Charge battery, repeat basic setting
P1565	17973	Throttle Valve Control Module -J338- lower stop not reached	○ Check Throttle Valve Control Module -J338-. Refer to **Throttle Valve Control Module -J338-, checking**
P1568	17976	Throttle Valve Control Module -J338- Mechanical malfunction	
P1569	17977	Cruise Control Set Signal Incorrect Signal	○ Check cruise control system. Refer to **Cruise Control System (CCS) switch -E45-, testing**

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1570	17978	Engine control unit disabled	○ Adapt Immobilizer to ECM. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions**
P1579	17987	Throttle Valve Control Module -J338- Adaption not initiated	○ Perform adaptation of Throttle Valve Control Module -J338- in accordance with preconditions. Refer to **Throttle Valve Control Module -J338-, adapting**
P1602	18010	Voltage supply - terminal 30 Voltage too low	○ Check supply voltage for Engine Control Module (ECM).

			Refer to **Motronic Engine Control Module (ECM) power supply, checking**
P1603	18011	Internal Control Module Memory Check Sum Error	○ Replace Engine Control Module (ECM). Refer to **Engine Control Module (ECM) (without metal anti-theft housing), replacing**
P1604	18012	Internal Control Module Memory Check Sum Error	
P1606	18014	Uneven road surface information/target engine torque from ABS control unit electrical fault in circuit	○ Check CAN-bus. Refer to **Data exchange, Motronic/ABS (CAN-bus), checking**
P1609	18017	Crash shut-off was triggered 4)	○ Perform airbag system self-diagnosis ○ After Output Diagnostic Test Mode (DTM) of airbag system erase Diagnostic Trouble Code (DTC) memory of engine control module. Refer to **Diagnostic Trouble Code (DTC) memory, checking**

4) The DTC is stored with the relevant signal from airbag control module, also with Output Diagnostic Test Mode (DTM) of the airbag system.

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1610	18018	Internal Control Module Memory Check Sum Error	○ Replace Engine Control Module (ECM). Refer to **Engine Control**

			Module (ECM) (without metal anti-theft housing), replacing
P1612	18020	Engine control unit incorrect coding	○ Code Engine Control Module (ECM). Refer to **EnCoding II Engine Control Module (ECM)**
P1620	18028	Signal for coolant temperature Open circuit/short circuit to B+	○ Check Engine Coolant Temperature (ECT) -G62- sensor. Refer to **Engine Coolant Temperature (ECT) sensor -G62-, checking**
P1621	18029	Signal for coolant temperature Short circuit to Ground (GND)	
P1622	18030	Coolant temperature signal implausible signal	
P1624	18032	Requirement - fault lamp on active 5)	○ Exhaust-relevant malfunction of Transmission Control Module -J217- ○ Read out Diagnostic Trouble Code (DTC) memory of Transmission Control Module -J217-

5) The transmission control module has recognized a malfunction which causes the exhaust emissions of the engine to deteriorate. The malfunction message is sent by the transmission control module to the engine control module which now switches on the Malfunction Indicator Lamp (MIL) -K83-. Notes on Malfunction Indicator Lamp (MIL) -K83-. Refer to **Malfunction Indicator Lamp (MIL) -K83- in instrument cluster**. At the same time the message P1624 is displayed in the engine control module as an indication that the Malfunction Indicator Lamp (MIL) -K83- was not switched on due to an engine problem but due to a transmission problem.

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1626	18034	Data-bus-drivetrain	

		missing message from transmission control module	○ Check CAN-bus. Refer to **Data exchange, Motronic/ABS (CAN-bus), checking**
P1628	18036	Data-bus-drivetrain missing message from steering angle sensor	
P1630	18038	Throttle/Pedal Position Sensor/Switch -C- Circuit Low	○ Check Throttle Position (TP) Sensor -G79-. Refer to **Throttle Position (TP) sensor 1 -G79- and Sender -2- for accelerator pedal position -G185-, checking**
P1631	18039	Throttle/Pedal Position Sensor/Switch -C- Circuit High	
P1633	18041	Accelerator pedal position sender 2 -G185- signal too low	
P1634	18042	Accelerator pedal position sender 2 -G185- signal too high	
P1635	18043	Data-bus-drivetrain missing message from A/C control module	○ Check CAN-bus. Refer to **Data exchange, Motronic/ABS (CAN-bus), checking**
P1636	18044	Data-bus-drivetrain missing message from airbag control module	
P1639	18047	Throttle/Pedal Position Sensor/Switch -C- Circuit Range/Performance	
P1640	18048	Internal Control Module Memory Check Sum Error	○ Replace Engine Control Module (ECM). Refer to **Engine Control Module (ECM)**

			(without metal anti-theft housing), replacing

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1648	18056	Data-Bus-driving gear faulty	○ Check CAN-bus. Refer to **Data exchange, Motronic/ABS (CAN-bus), checking**
P1649	18057	Data-bus-drivetrain missing message from ABS control module	
P1650	18058	Data-bus-drivetrain missing message from instrument cluster	
P1654	18062	Check instrument cluster DTC memory.	○ Check Diagnostic Trouble Code (DTC) memory of instrument cluster
P1659	18067	Fan 1 Control Circuit High	○ Check Coolant Fan -V7-. Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations
P1660	18068	Fan 1 Control Circuit Low	
P1672	18080	Radiator fan activation 1 Open circuit/short circuit to Ground (GND)	

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1682	18090	Powertrain databus Unplausible message from ABS control module	○ Check CAN-bus. Refer to **Data exchange, Motronic/ABS (CAN-bus), checking**
P1683	18091	Powertrain databus Unplausible message from airbag control	

		module	
P1687	18095	Data-Bus-driving gear Implausible message from climate control module	
P1696	18104	Powertrain databus implausible signal from Steering Column Electronic	○ Engine Control Module (ECM) coded for cruise control system but cruise control system is not installed. Deactivate cruise control system. Refer to **Coding II** ○ Check CAN-bus. Refer to **Data exchange, Motronic/ABS (CAN-bus), checking**
P1698	18106	Read fault memory of Steering Column Electronic	○ Interrogate DTC memory of steering column electronics

DTC code		DTC text	Corrective action
SAE	V.A.G		
P1699	18107	Powertrain databus missing message from Steering Column Electronic	○ Engine Control Module (ECM) coded for cruise control system but cruise control system is not installed. Deactivate cruise control system. Refer to **Coding II** ○ Check CAN-bus. Refer to **Data exchange, Motronic/ABS (CAN-bus), checking**
P1912	18320	Brake Booster Pressure Sensor -G294- Short circuit to B+	. Refer to **47 - BRAKES - HYDRAULIC COMPONENTS**
P1913	18321	Brake Booster Pressure Sensor -G294- Short	

		circuit to Ground (GND)	
P1931	18339	Coolant FC (Fan Control) Control Module -J293- Malfunction	○ Check Coolant Fan Control Module -J293-. Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

DTC		DTC text	Corrective action
SAE	VAG		
P2181	18613	Cooling System Performance	○ Check Engine Coolant Temperature (ECT) Sensor -G62- ○ Check thermostat. Refer to **19 - ENGINE - COOLING SYSTEM** ; cooling system components, removing and installing
P3078	19534	Throttle Valve Control Module Air throughput too low at idle (soiled)	○ Clean throttle valve control module. Refer to **Throttle valve control module, cleaning**
P3081	19537	Engine temperature too low	○ Check Engine Coolant Temperature (ECT) Sensor -G62- ○ Check thermostat. Refer to **19 - ENGINE - COOLING SYSTEM** ; cooling system components, removing and installing

OUTPUT DIAGNOSTIC TEST MODE (DTM)

Output Diagnostic Test Mode (DTM)

NOTE:

- **The Output Diagnostic Test Mode (DTM) can only be performed with the engine stopped and the ignition switched on.**
- **During actuator diagnosis, the individual actuators (with the exception of the injectors) are operated in turn for about one minute unless the next actuator is selected by pressing the delta button.**
- **The control elements can be checked acoustically or by way of touch.**
- **The Output Diagnostic Test Mode (DTM) is terminated, if after 1 minute actuation time the next control element is not switched to, or the engine is started or an engine speed pulse is detected.**
- **Before restarting the Output Diagnostic Test Mode (DTM) the engine must be started and the ignition switched off and on again.**

The Output Diagnostic Test Mode (DTM) activates the following components in the stated order:

Activation sequence	
1	Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-
2	Secondary Air Injection (AIR) Solenoid Valve -N112-
3	Secondary Air Injection (AIR) Pump Relay -J299-
4	Wastegate Bypass Regulator Valve -N75-
5	Camshaft timing control
6	Leak Detection Pump (LDP) -V144-
7	Recirculating valve for turbocharger -N249-
8	Activate brake vacuum pump 1)
9	Coolant Fan Control 1 -J293-
10	Fuel injector, cylinder 1 -N30-
11	Fuel injector, cylinder 3 -N32-
12	Fuel injector, cylinder 4 -N33-
13	Fuel injector, cylinder 2 -N31-

1) Only on vehicles with automatic transmission.

Requirements

- Fuses for engine electronics OK

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 and select vehicle system "01 - Engine electronics" in selection list. Ignition must be switched on.

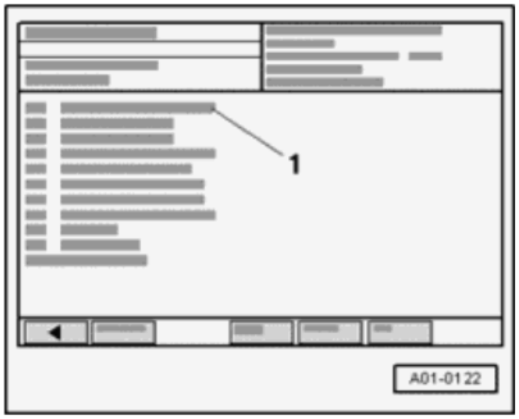

Fig. 14: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "03 - Output Diagnostic Test Mode (DTM)".

Activating Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-

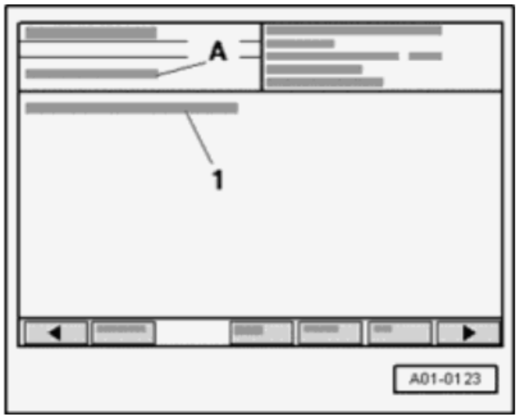

Fig. 15: Display On VAS 5051 - (1st Control Element In Test & Evaporative Emission (EVAP) Canister Purge Regulator Valve-N80-)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

A - control element test running advance necessary

1 - Evaporative Emission (EVAP) Canister Purge Regulator -N80-

- Press delta button.

Display on VAS 5051:

A - control element test running advance permitted

- This valve is activated (clicks) for approx. 1 minute if the operation is not switched to the next control element by pressing the delta button.

NOTE: **Fuel pump must run during actuation time, the flow noise at fuel pressure regulator must be clearly audible If fuel pump does not run, check activation:**

Refer to **20 - FUEL SUPPLY SYSTEM**

If the valve is not activated (does not click).

- Check Evaporative Emission (EVAP) Canister Purge Regulator -N80-. Refer to **Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, checking**.

Activating Secondary Air Injection (AIR) solenoid valve -N112-

- Press delta button.

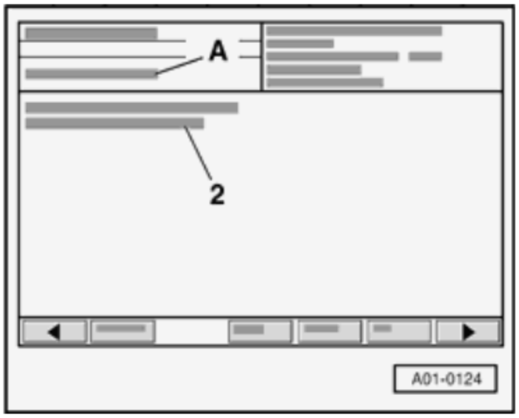

Fig. 16: Display On VAS 5051 - (2nd Control Element In Test & Secondary Air Injection (AIR) Solenoid Valve -N112-)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

A - control element test waiting advance necessary

2 - Secondary Air Injection (AIR) Solenoid Valve -N112-

- Press delta button.

Display on VAS 5051:

A - control element test running advance permitted

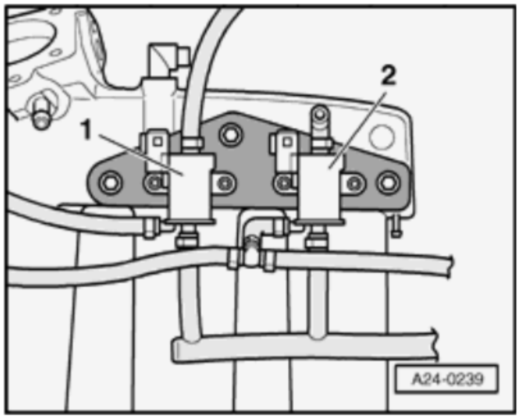

Fig. 17: Identifying Secondary Air Injection (AIR) Solenoid Valve -N112-
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- This valve (-Pos. 2- under intake manifold) is activated (clicks) for approx. 1 minute if the operation is not switched to the next control element by pressing the delta button.

NOTE: The fuel pump must run during the activation time.

If the valve is not activated (does not click).

- Check Secondary Air Injection (AIR) Solenoid Valve -N112-:

Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS**

Activating Secondary Air Injection (AIR) Pump Relay -J299-

- Press delta button.

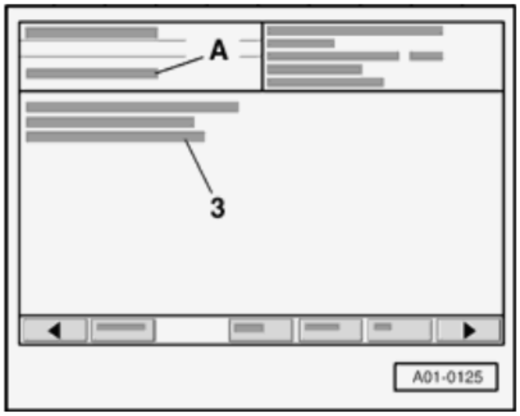

Fig. 18: Display On VAS 5051 - (3rd Control Element In Test & Secondary Air Pump Relay -J299-)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

A - control element test running advance permitted

3 - Secondary Air Injection (AIR) Pump Relay -J299-

- Press delta button.

Display on VAS 5051:

A - control element test running advance permitted

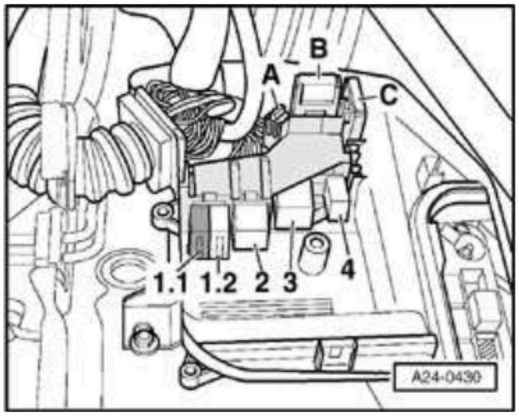

Fig. 19: Component Location For Secondary Air Injection (AIR) Pump Relay J299
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The Secondary Air Injection (AIR) Pump Relay -J299- (in relay carrier in electronics box, plenum chamber, position 3) switches the engine for the Secondary Air Injection (AIR) Pump Motor -V101- on and off at approx. 1 minute intervals if the operation has not been switched to the next control element by pressing the delta button.

NOTE: The fuel pump must run during the activation time.

If secondary air pump does not run intermittently:

- Check Secondary Air Injection (AIR) Pump Relay -J299-:

Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS**

Activating Wastegate Bypass Regulator Valve -N75-

- Press delta button.

Fig. 20: Display On VAS 5051 - (4th Control Element In Test & Charge Pressure Control Valve -N75)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

A - control element test running advance permitted

4 - Wastegate Bypass Regulator Valve -N75-

- Press delta button.

Display on VAS 5051:

A - control element test running advance permitted

- This valve is activated (clicks) for approx. 1 minute if the operation is not switched to the next control element by pressing the delta button.

NOTE: The fuel pump must run during the activation time.

If the valve is not activated (does not click).

Refer to **21 - TURBOCHARGER, G-CHARGER**

Activating camshaft adjustment valves

- Press delta button.

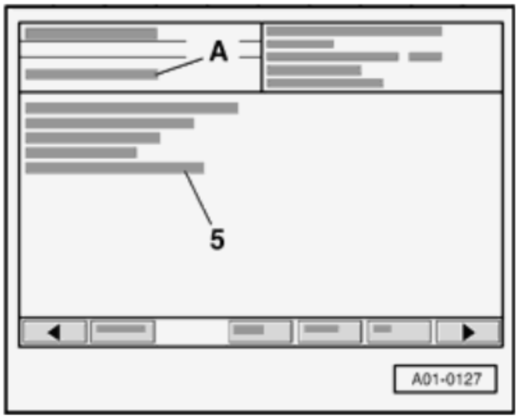

Fig. 21: Display On VAS 5051 - (4th Control Element In Test & Charge Pressure Control Valve -N75)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

A - control element test waiting advance necessary

5 - Camshaft timing control

- Press delta button.

Display on VAS 5051:

A - control element test running advance permitted

- This valve is activated (clicks) for approx. 1 minute if the operation is not switched to the next control element by pressing the delta button.

NOTE: The fuel pump must run during the activation time.

If the valve is not activated (does not click).

- Check camshaft adjustment valves:

Refer to **15 - ENGINE - CYLINDER HEAD, VALVETRAIN**

Activating Leak Detection Pump (LDP) -V144-

- Press delta -button.

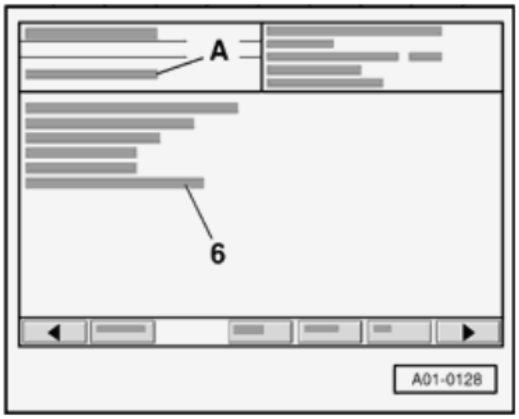

Fig. 22: Display On VAS 5051 - (Actuator In Test & Leak Detection Pump Tank Ventilation System)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

A - control element test waiting advance necessary

6 - Leak Detection Pump (LDP) -V144- tank ventilation system

- Press delta -button again.

Display on VAS 5051:

A - control element test running advance permitted

- Leak Detection Pump (LDP) -V144- is activated (clicks) in intervals for approx. 1 minute, unless the delta -button is pressed to switch to the next actuator.

NOTE: Operating noise of Leak Detection Pump (LDP) is softly audible at left rear wheelhouse.

If Leak Detection Pump (LDP) for tank ventilation system is not activated (no operating noise is audible):

- Check Leak Detection Pump (LDP) for tank ventilation system:

Refer to **20 - FUEL SUPPLY SYSTEM**

Activating Recirculating valve for turbocharger -N249-

- Press delta button.

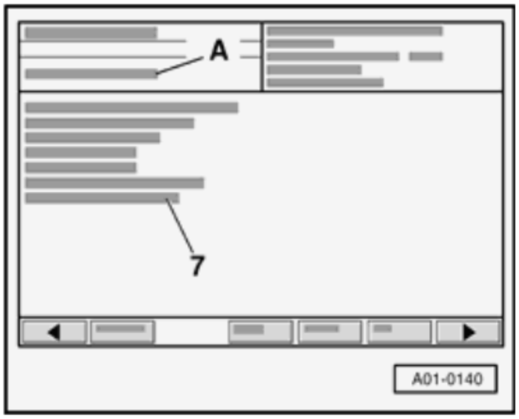

Fig. 23: Display On VAS 5051 - (7th Control Element In Test & Recirculating Valve For Turbocharger -N249-)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

A - control element test waiting advance necessary

7 - Recirculating valve for turbocharger -N249-

- Press delta button.

Display on VAS 5051:

A - control element test running advance permitted

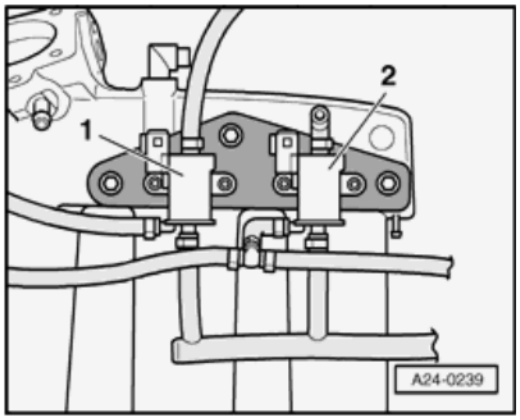

Fig. 24: Identifying Secondary Air Injection (AIR) Solenoid Valve -N112-
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- This valve (-Pos. 1- under intake manifold) is activated (clicks) for approx. 1 minute if the operation is not switched to the next control element by pressing the delta button.

NOTE: The fuel pump must run during the activation time.

If the valve is not activated (does not click).

Refer to **21 - TURBOCHARGER, G-CHARGER**

Activating brake vacuum pump 1)

1) Only on vehicles with automatic transmission.

- Press delta button.

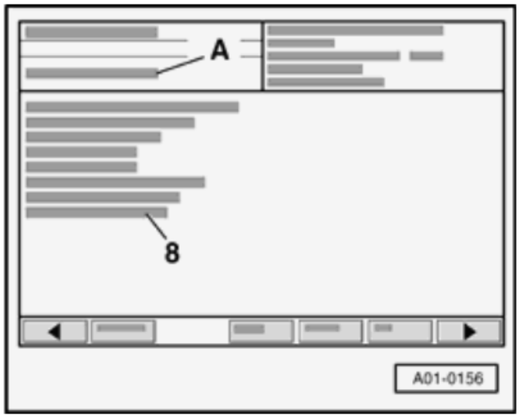

Fig. 25: Display On VAS 5051 - (Activation Of Brake System Vacuum Pump)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

A - Control element test waiting advance necessary

8 - Activation of brake vacuum pump

- Press delta button.

Display on VAS 5051:

A - control element test running advance permitted

- The brake servo vacuum pump, front left in engine compartment, must start up for a short time, unless the operation has been switched to the next control element by pressing the delta button.

If the brake servo vacuum pump does not start up:

- Check brake servo vacuum pump:

Refer to **47 - BRAKES - HYDRAULIC COMPONENTS**

Activating Coolant Fan Control (FC) control module -J293-

- Press delta button.

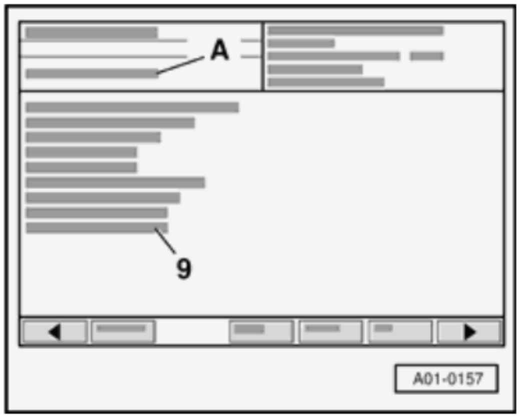

Fig. 26: Display On VAS 5051 - (9th Control Element In Test & Injector - Cyl. 1 -N30-)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

A - control element test waiting advance necessary

9 - Coolant Fan activation

- Press delta button.

Display on VAS 5051:

A - control element test running advance permitted

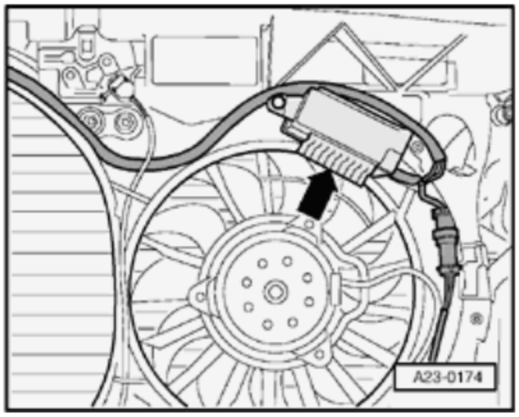

Fig. 27: Identifying Coolant Fan Control 1 -J293-
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The Coolant Fan Control 1 -J293- (top right on radiator cowl -arrow-) switches the coolant fan on once slowly to full speed, if the operation has not been switched to the next control element by pressing the delta button.

NOTE: **The fuel pump must run during the actuation time.**

If the fan does not start:

- Check coolant fan and Coolant Fan Control 1 -J293-.

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

Activating fuel injectors

NOTE: **Fuel injectors are activated according to ignition sequence: Cyl. 1, Cyl. 3, Cyl 4, Cyl. 2.**

- Press delta button

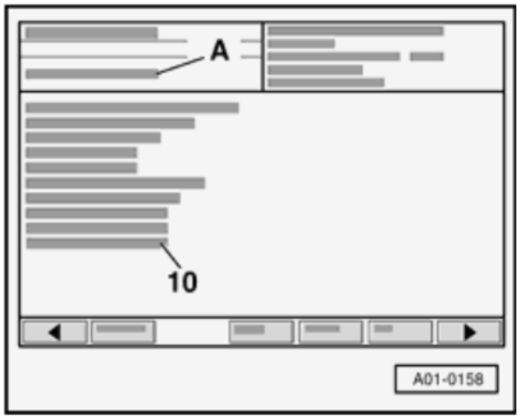

Fig. 28: Display On VAS 5051 - (Cylinder 1 Fuel Injector -N30-)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

A - control element test waiting advance necessary

10 - Cylinder 1 fuel injector -N30-

- Press delta button again.

Display on VAS 5051:

A - control element test running advance permitted

- Fuel injector must click 5 times after delta button is pressed.

NOTE: **Fuel pump must run during activation time.**

- Press delta button

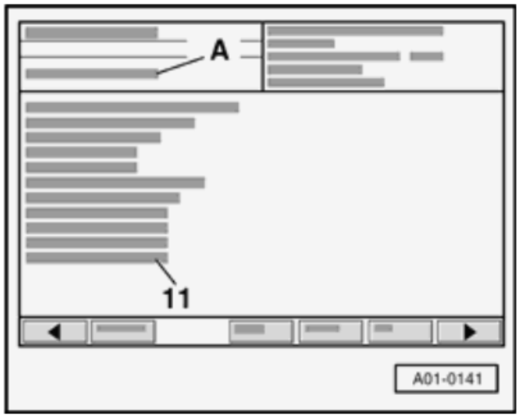

Fig. 29: Display On VAS 5051 - (11th Control Element In Test & Injector - Cyl. 4 -N33-)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

A - control element test waiting advance necessary

11 - Cylinder 3 Fuel Injector -N32-

- Press delta button again.

Display on VAS 5051:

A - control element test running advance permitted

- Fuel injector must click 5 times after delta button is pressed.

NOTE: Fuel pump must run during activation time.

- Press delta button

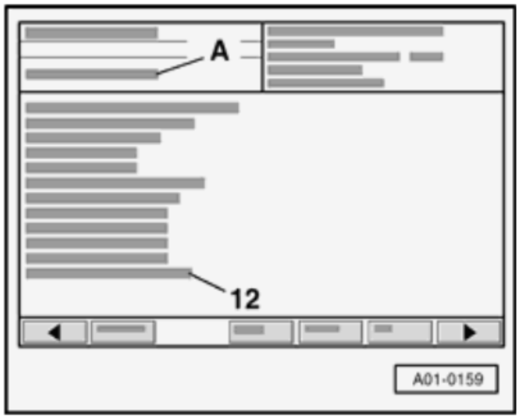

Fig. 30: Display On VAS 5051 - (12th Control Element In Test & Injector - Cyl. 2 -N31-)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

A - control element test waiting advance necessary

12 - Cylinder 4 Fuel Injector -N33-

- Press delta button again.

Display on VAS 5051:

A - control element test running advance permitted

- Fuel injector must click 5 times after delta button is pressed.

NOTE: Fuel pump must run during activation time.

- Press delta button

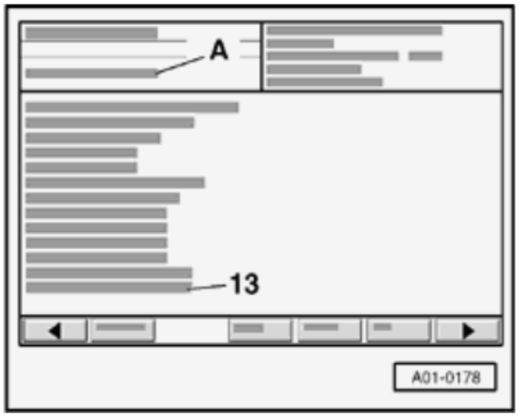

Fig. 31: Display On VAS 5051 - (13th Cylinder 2 Fuel Injector -N31-)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

A - control element test waiting advance necessary

13 - Cylinder 2 Fuel Injector -N31-

- Press delta button again.

Display on VAS 5051:

A - control element test running advance permitted

- Fuel injector must click 5 times after delta button is pressed.

NOTE: Fuel pump must run during activation time.

If one of the fuel injectors is not activated (does not click).

- Check fuel injectors. Refer to **Fuel injectors, checking**.
- Press delta button

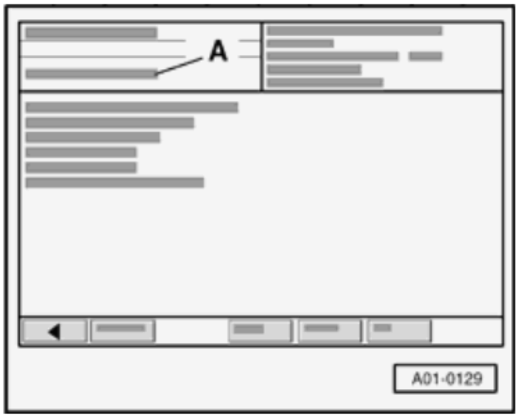

Fig. 32: Display On VAS 5051 - (Output Diagnostic Test Mode Is Completed)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

A - Actuator test has ended

- End function "03 - output Diagnostic Test Mode (DTM)" by pressing <-- button.

NOTE: Before re-initiating output Diagnostic Test Mode (DTM), engine must be started and the ignition must be switched off and on again.

BASIC SETTING

Basic setting

With engine stopped and ignition switched on, the following operation can be carried out with the "Function 04" basic setting:

- Adaptation of the Throttle Drive Control to the Engine Control Module (ECM). Refer to Display group 060 (Refer to **Throttle Valve Control Module -J338-, adapting**)
- Vehicles with automatic transmission: Adaptation of kick-down function of Throttle Position (TP) Sensor to Engine Control Module (ECM). Refer to Display group 063 (Refer to **Kick-down function, adapting**)

With the engine running, the following operations can be performed with the basic setting function:

- Generation of readiness code. Refer to **Readiness code, generating**
- Performance of Oxygen Sensor (O2S) and Oxygen Sensor control (Refer to **Oxygen Sensor (O2S) and Oxygen Sensor control before catalytic converter, checking**)

Conditions for operations with engine running

- No DTCs stored in Diagnostic Trouble Code (DTC) memory
- Coolant temperature at least 80 ° C.
- Electrical devices switched off (coolant fan must not run during the test).
- Air conditioning switched off.

- Vehicles with automatic transmission: Selector lever in position P or N.

Work sequence

- Connect VAS 5051 tester. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 - Engine electronics". Ignition must be switched on for this.

or, depending on desired operation:

- Start engine.

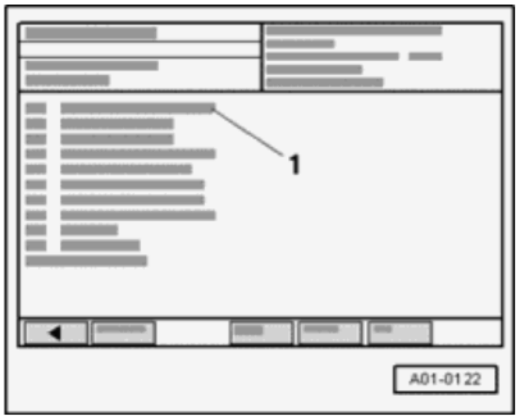

Fig. 33: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- In selection -1-, click on diagnostic function "04 - Basic Setting".

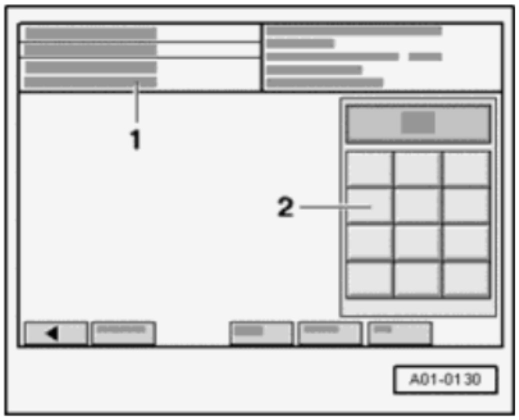

Fig. 34: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter desired 3-digit display group number in button field -2- and press -Q- button to confirm input.

Example:

- Press buttons -0-, -0- and -1- to select "display group number 001" and press -Q- button to confirm input.

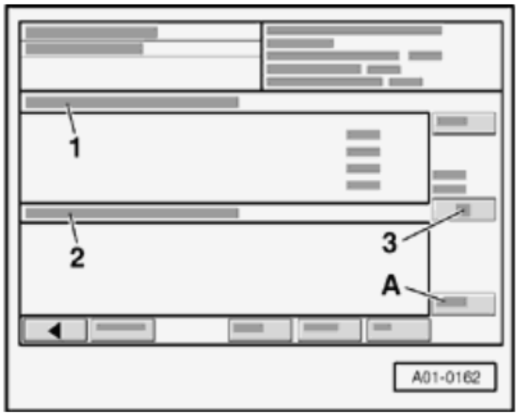

Fig. 35: Identifying Display On VAS 5051 (Measured Values)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Measured values not in basic setting

2 - Measured values in basic setting

3 - Display group X

A - Activating basic setting

NOTE: **Basic setting is initiated after button -A- is pressed.**

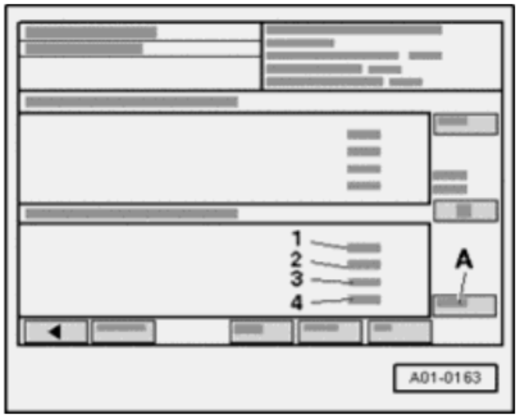

Fig. 36: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Display field 1

2 - Display field 2

3 - Display field 3

4 - Display field 4

- End function "04 - Basic setting" by pressing <-- button.

ENCODING II ENGINE CONTROL MODULE (ECM)

EnCoding II Engine Control Module (ECM)

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection. Ignition must be switched on.

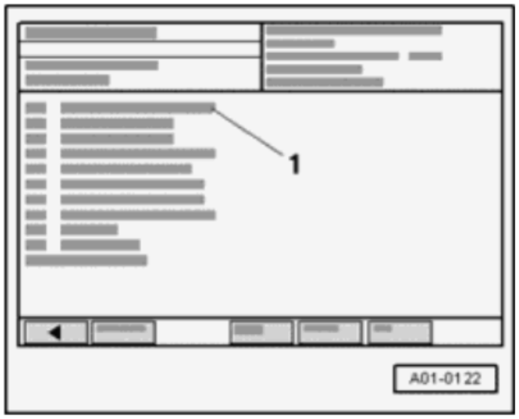

Fig. 37: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "07 - Encode Engine Control Module".

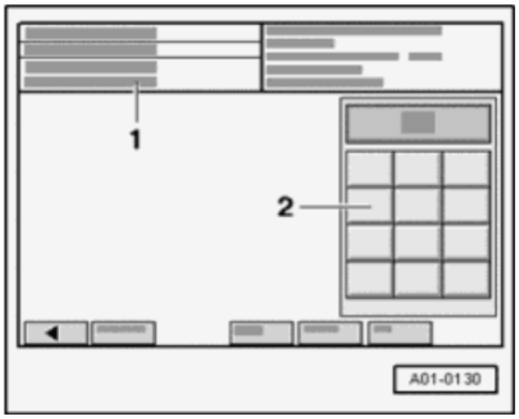

Fig. 38: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter code max. input value = 32767

- Enter 7-digit control module Coding II in button field -2- according to Coding II table. Refer to **Coding II table**.
- Enter Engine Control Module code in zone -2- in line with enCoding II table. Refer to **Coding II table**.

Key to code

XX	Empty Characters					
	XX	Country/emissions				
		X				Drive/auxiliary

						functions
			X			Transmission
				X		Model

Coding II example	
0016501	Empty characters, ULEV (emissions regulation), Front Wheel Drive (FWD) with ASR/ESP, 5-Spd. manual transmission, Audi A4

Coding II table

Empty characters	00					
Country/emissions		16				ULEV (emissions regulation)
Drive/auxiliary functions			0			Front Wheel Drive without TCS/ESP
			2			All Wheel Drive without traction control system
			5			Front-wheel drive with TCS/ESP
			7			All Wheel Drive with traction control system
Transmission				0		5-Speed Manual Transmission
				1		6-Speed Manual Transmission
				5		Automatic Transmission 01V
				8		Multitronic 01J
Model					1	Audi A4

- Confirm entry with -Q- button.

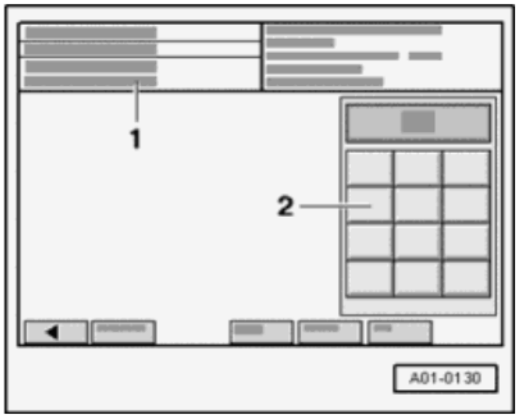

Fig. 39: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Coding II being carried out

- Wait until next display appears.

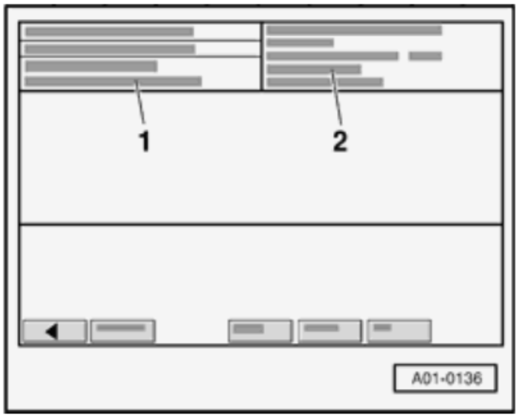

Fig. 40: Diagnostic System VAS 5051: Display - (Coding Of Vehicle System Performed & Control Module Identification With New Coding)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Coding II being carried out in vehicle system

2 - Control module identification with new code

(previous code in brackets)

- Exit function "07 - Encode Engine Control Module" by pressing the <-- button.
- Switch ignition off and then switch on again after 15 seconds.

NOTE:

- **The next time the ignition is switched on the newly entered code will be activated.**
- **If the ignition is not switched off and on after the correct code has been entered, it will not be possible to erase DTC "01044 Control module incorrectly coded").**

MEASURED VALUE BLOCK, READING

Measured value block, reading

Requirements

- Coolant temperature at least 80 ° C.
- Electrical devices switched off (coolant fan must not run during test).
- Air conditioning switched off.

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection. Engine must be run at idle.

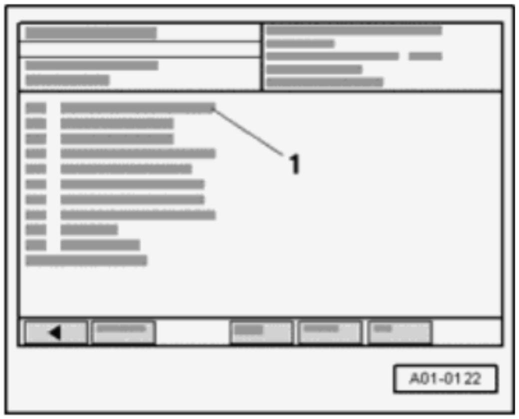

Fig. 41: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "08 - Read measured value block".

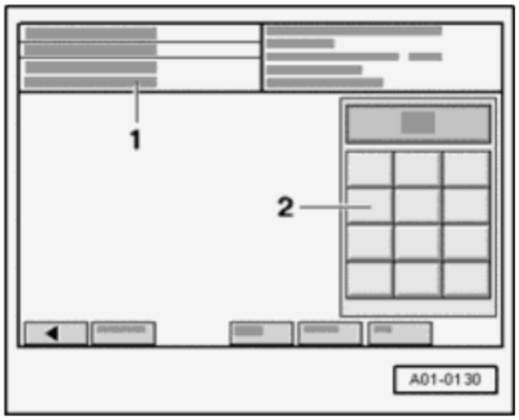

Fig. 42: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter desired display group number (three figures) in zone -2- and confirm entry by pressing -Q- button.

NOTE: **The choice of display group depends on the particular functions and components to be tested.**

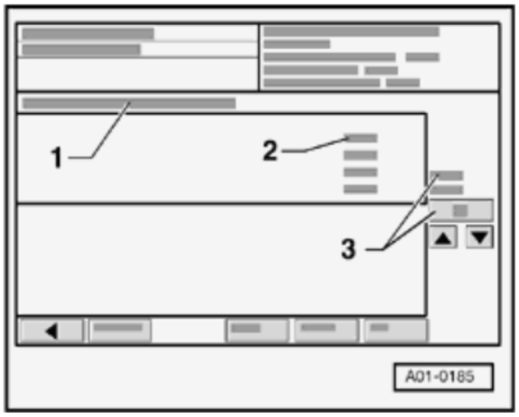

Fig. 43: Diagnostic System VAS 5051: Display Zones
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Display group X

2 - Display zone 1

Display zone 2

Display zone 3

Display zone 4

3 - Display group X

NOTE:

- **If no display follows, a display field is not assigned.**
- **To switch to a different display group, proceed as follows:**

Display group	**VAS 5051 tester**
Higher	Press ? button.
Lower	Press ? button.

- Press <-- button to end function "08 - Read measuring value block".

CODING II

Coding II

With ignition switched on and engine at standstill, the following operations can be performed using function "11 - Coding II":

- Activating and deactivating cruise control system. Refer to **Cruise control system, activating/deactivating**

Cruise control system, activating/deactivating

NOTE:

- **For vehicles equipped with cruise control system, the cruise control system must be activated after replacing Engine Control Module (ECM).**
- **If cruise control system is activated in Engine Control Module (ECM) in a vehicle without the cruise control system, a DTC entry follows. In this case, the cruise control system function must be deactivated.**

Work sequence

- Connect VAS 5051 tester. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 - Engine electronics". Ignition must be switched on for this.

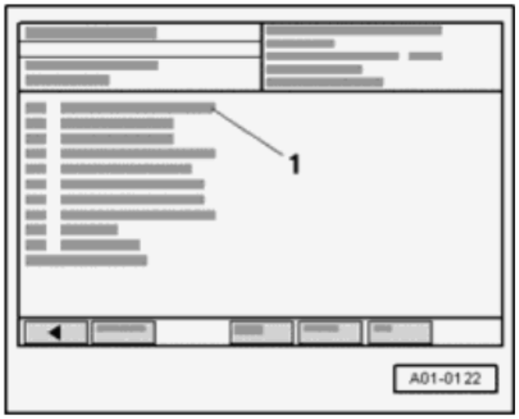

Fig. 44: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- In selection -1-, select diagnostic function "11 - Coding II".

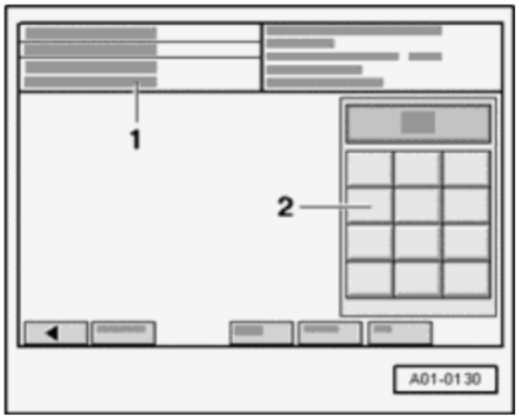

Fig. 45: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter code word

Activating cruise control system

- Select "11463" in button field -2- and press -Q- button to confirm input.

Deactivating cruise control system

- Select "16167" in button field -2- and press -Q- button to confirm input.
- End function "11 - Coding II" by pressing <-- -button.

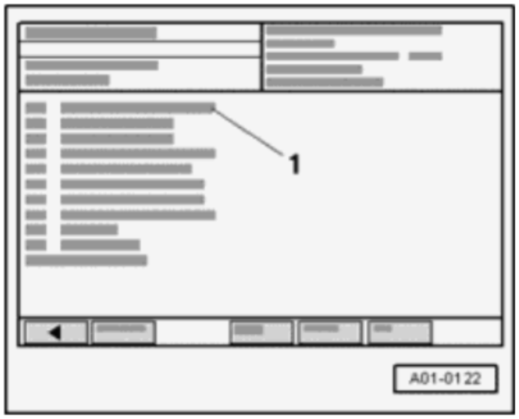

Fig. 46: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Select diagnostic function "08 - read measured value block" in selection -1-.

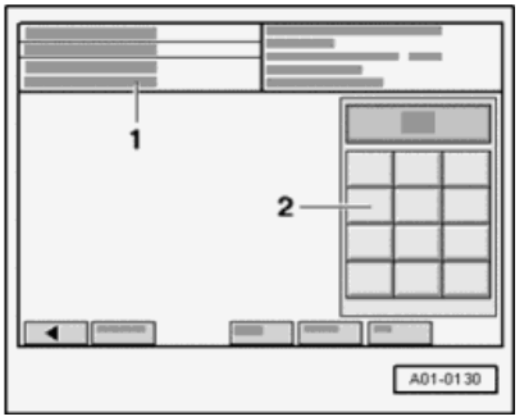

Fig. 47: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Select function "066" in button field -2- for "Display group number 066" and press -Q- button to confirm input.

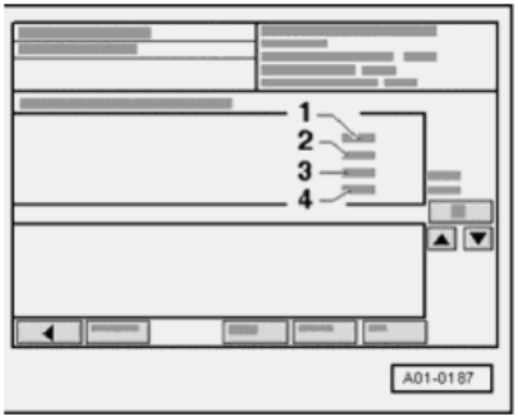

Fig. 48: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Check indication in display field -2-.

	Display fields			
	1	2	3	4
Display group 066: Signals to Engine Control Module (ECM)				
Display	xxx km/h	**XXXXXXXX**	xxx km/h	XXXXXXXX
Indicated	ACTUAL speed	**Switch positions**	SPECIFIED speed	Switch positions
Functional range		**0 = off 1 = on**		0 = off 1 = on
Specified value		**XXXX0XXX (cruise control not activated)**		XXXXXXXX
		XXXX1XXX (cruise control activated)		
Note		**Value: X = no significance**		

- Press <-- button to end function "08 - Read measuring value block".
- Select "06 - End Output"
- Switch ignition off.

READINESS CODE

Readiness code

The readiness code appears as an 8-digit display on measured value block 086, display zone 1. Each of the 8 digits is allocated to a particular emission-related system.

The function of each of these systems is checked by the self-diagnosis and the relevant position for the system in the 8-digit display is changed from "1" to "0" in a test sequence which must be fully completed.

The readiness code produced after successful completion of the test sequence is then "0 0 0 0 0 0 0 0" (measured value block 086, display zone 1).

If an individual test has been completed, but is "not OK", a DTC is entered in the Diagnostic Trouble Code (DTC) memory. Checking Diagnostic Trouble Code (DTC) memory. Refer to **Diagnostic Trouble Code (DTC) memory, checking** .

The readiness code is reset to "0 1 1 0 1 1 0 1" if:

- Diagnostic Trouble Code (DTC) memory has been erased,
- Voltage supply to the ECM has been interrupted (e.g. the connector disconnected, battery disconnected).
- A new Engine Control Module has been installed

Generate readiness code. Refer to **Readiness code, generating**.

NOTE: When driving with varying loads the exhaust relevant tests are initiated by the control module and the readiness code produces itself. In this case the concluding control possibility is omitted, i.e. it is not obvious whether the vehicle was handed over to the customer without any DTCs.

Readiness code, reading

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection.

Engine must be run at idle.

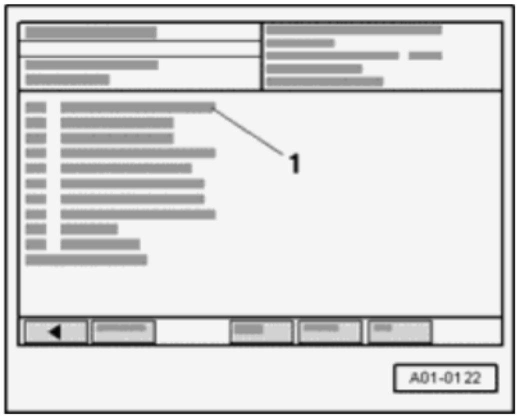

Fig. 49: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- ○ Under -1- select diagnostic function "08 - Read measured value block".

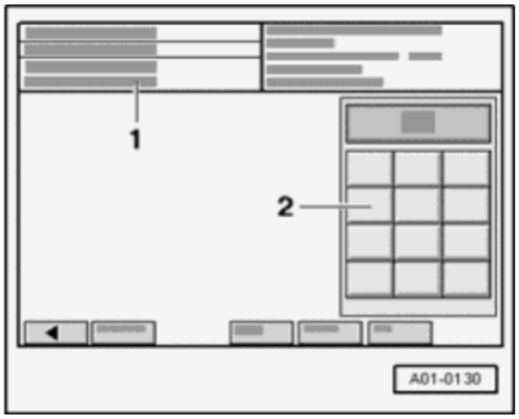

Fig. 50: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- ○ Enter "086" for "display group number 086" in zone -2- and confirm entry by pressing -Q- button.

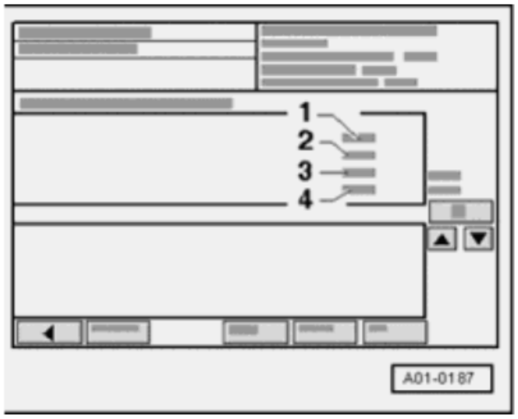

Fig. 51: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- ○ Check indication in display field -1-.
- ○ Check readiness code in display zone -1-.

- Specified value: 0 0 0 0 0 0 0 0

	Display zones			
	1	2	3	4
Display group 086: Readiness code				
Display	**0 0 0 0 0 0 0 0**	X X X X X X X X	X X X X X X X X	
Display	**Ready bits Completed tests**	Individual tests performed	Individual tests performed	
Range	**1 = not completed 0 = completed**	1 = not completed 0 = completed	1 = not completed 0 = completed	
Specified value	**0 0 0 0 0 0 0 0**	X X X X X X X X	X X X X X X X X	
Explanation of readiness code. Refer to **Readiness code, reading**				

Note on display zone 1:

Display zone 1 is the most important. This display indicates which system has been checked by the self-diagnosis since the last time the Diagnostic Trouble Code (DTC) memory was erased or since installation of a new control module. After erasing the Diagnostic Trouble Code (DTC) memory, all testable values are set to "1" and then to "0" after successful completion of the test.

X	**X**	**X**	**X**	**X**	**X**	**X**	**X**	Notes on display group 086, display zone 1
								Three Way Catalytic Converter (TWC) diagnosis • Display 0 = Test was carried out • Display 1 = Test was not carried out (generate readiness code. Refer to **Readiness code, generating**)
								Display always 0
								Evaporative Emission (EVAP) system • Display 0 = Test was carried out • Display 1 = Test was not carried out (generate readiness code. Refer to **Readiness code, generating**)
								Secondary Air Injection (AIR) system • Display 0 = Test was carried

								out • Display 1 = Test was not carried out (generate readiness code. Refer to **Readiness code, generating**)
								Display always 0
								Oxygen Sensors (O2S) • Display 0 = Test was carried out • Display 1 = Test was not carried out (generate readiness code. Refer to **Readiness code, generating**)
								Oxygen Sensor (O2S) heater • Display 0 = Test was carried out • Display 1 = Test was not carried out (generate readiness code. Refer to **Readiness code, generating**)
								Display always 0

NOTE: The readiness code is only produced when all display digits in display zone 1 are set to "0".

If the specification "0 0 0 0 0 0 0 0" is achieved in display zone 1:

- Press <-- button.
- Check Diagnostic Trouble Code (DTC) memory to check. Refer to **Diagnostic Trouble Code (DTC) memory, checking** (there must not be any stored DTCs).

If specified value is not obtained:

- Generate readiness code. Refer to **Readiness code, generating**

Readiness code, generating

Conditions

- Vehicle stationary.
- Electrical devices switched off (coolant fan must not run during test).
- Air conditioning switched off.

- Vehicles with automatic transmission: Selector lever in position P or N.

NOTE: **If the test result is immediately displayed as "OK" after selecting a display group during an operation, the test has already been performed and you can continue with the next operation.**

Operation 1: Checking Diagnostic Trouble Code (DTC) memory

Conditions

- Engine stopped, ignition switched on

○ Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 - Engine electronics" in selection. Ignition must be switched on.

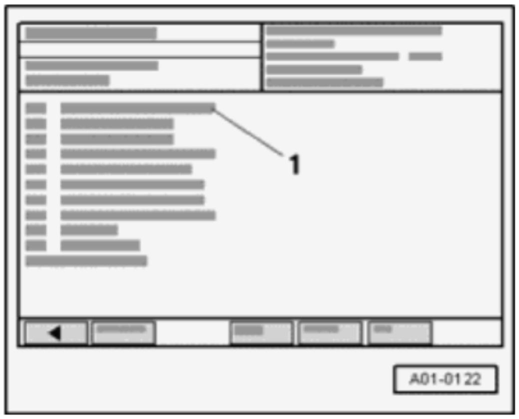

Fig. 52: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

○ Under -1- select diagnostic function "02 - Check Diagnostic Trouble Code (DTC) memory".

Fig. 53: Identifying Content Of DTC Memory & Identification Of Fault On Diagnostic System VAS 5051 Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Content of the Diagnostic Trouble Code (DTC) memory:

- 0 DTCs recognized

or

- X DTCs recognized

2 - DTCs

- DTC code
- DTC location
- DTC type

If a DTC is stored:

- Repair DTC and erase Diagnostic Trouble Code (DTC) memory. Perform a road test and check DTC memory again.

If no DTC is stored:

- Press <-- button.
- Perform next operation.

Operation 2: Erasing Diagnostic Trouble Code (DTC) memory

Conditions

- Engine stopped, ignition switched on

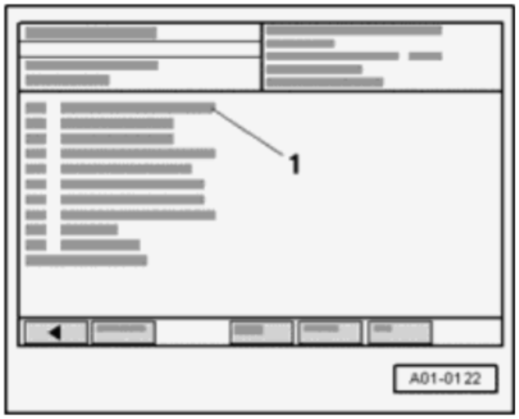

Fig. 54: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "05 - Erase Diagnostic Trouble Code (DTC) memory".

NOTE: The readiness code is reset when the Diagnostic Trouble Code (DTC) memory is erased and must therefore be reproduced.

Fig. 55: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- 1 - No display (before erasing)

or

- Diagnostic Trouble Code memory erased

2 - Is the function to be carried out?

Note: Data will be erased!

- Press "OK" button in display -2-.
- Press <-- button.
- Perform next operation.

Operation 3: Adapting Throttle Valve Control Module -J338- to Engine Control Module (ECM)

Conditions

- Engine stopped, ignition switched on

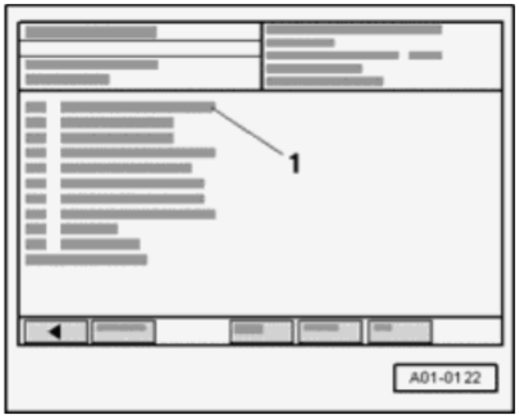

Fig. 56: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "04 - Basic setting".

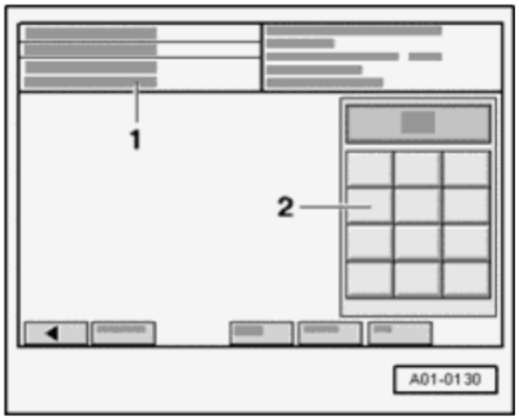

Fig. 57: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "060" for "display group number 060" in zone -2- and confirm entry by pressing -Q- button.

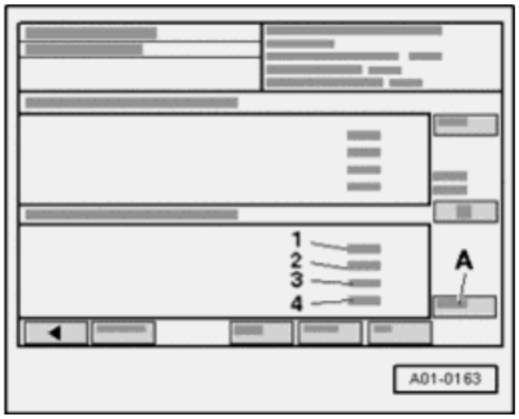

Fig. 58: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Check specifications in display zones -3- and -4-.
- Check indication in display fields -3- and -4-.

	Display zones			
	1	2	3	4
Display group 060: Adaptation of Throttle Valve Control Module				
Display	xx %	xx %	**x**	**---**
Display	Angle sensor -1- for throttle drive	Angle sensor -2- for throttle drive	**Adaptation stage counter**	**Adaptation status**
Range			**0...8**	**ADP process running** **ADP OK** **ERROR**
Specified value	3...93%	97...3%	**8**	**ADP OK**
		The adaptation stage counter reaches the number 8 after adaptation (some numbers may also be skipped)	If "ERROR" is displayed: check DTC memory. Refer to **Diagnostic Trouble Code (DTC) memory, checking** If specified value is not obtained: Note: Refer to **The**	

			control module can abort adaptation for the following reasons:	

Note on display zone 3:

During adaptation, various digits are displayed in display zone 3 which represent the relevant adaptation status. The most crucial factor is not the way in which the adaptation stage counter (display zone 3) behaves during the adaptation process, but that the specification "ADP OK" is displayed after adaptation in display zone 4.

If specification "ADP OK" is obtained:

- Press <-- button and perform next operation.

Operation 4: Adapting kick-down function1)

1) Only on vehicles with automatic transmission.

Conditions

- Engine stopped, ignition switched on

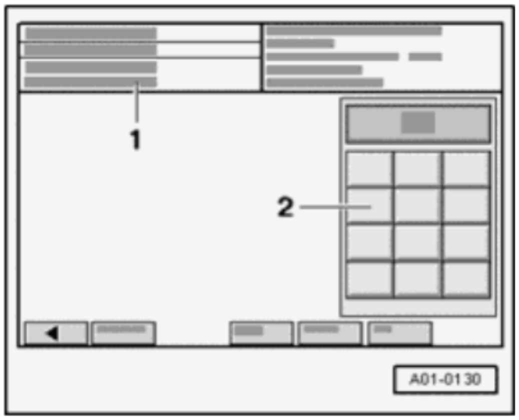

Fig. 59: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "063" for "display group number 063" in zone -2- and confirm entry by pressing -Q- button.

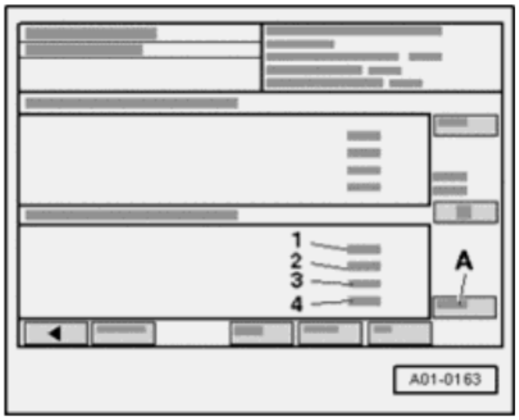

Fig. 60: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.

NOTE: **You will now be instructed to: "Operate kick down".**

- Fully depress accelerator pedal beyond kick-down point and keep it pressed.

NOTE: **During the kick-down point adaptation process, "Kick-down ADP is running" is shown on the display. After successful adaptation of the kick-down point "Kick-down ADP OK" appears on the display.**

- Check indication in display field -4-.

	Display zones			
	1	2	3	4
Display group 063: Adaptation of kickdown function				
Display	xx %	xx %	**Kick down**	**---**
Display	Throttle Position (TP) Sensor 1	Adapted kick-down value for Throttle Position (TP) Sensor 1	**Kick down**	**Adaptation status**
Range			**Kick down**	**Starting** **ADP process running** **ADP OK** **ERROR**
Specified value	79...94%	79...94%	**Kick down**	**ADP OK**
			If "ERROR" is displayed: Check	

			Diagnostic Trouble Code (DTC) memory. Refer to **Diagnostic Trouble Code (DTC) memory, checking**	

Note on display zone 4:

"ERROR" may be displayed, if e.g. accelerator pedal is not pressed immediately when instructed by tester, or if accelerator pedal was released while adaptation was already running but process was not yet complete. In both cases exit "basic setting" mode and perform adaptation again.

If specification "ADP OK" is obtained:

- Press <-- button then perform next operation.

Operation 5: Checking operating status of oxygen sensor control

- Start engine (for vehicles with manual transmission: press clutch pedal).

NOTE: **If necessary, after the engine starts reselect vehicle system "01 - Engine electronics" and diagnostic function "04 -Basic setting".**

Conditions

- Engine at idle

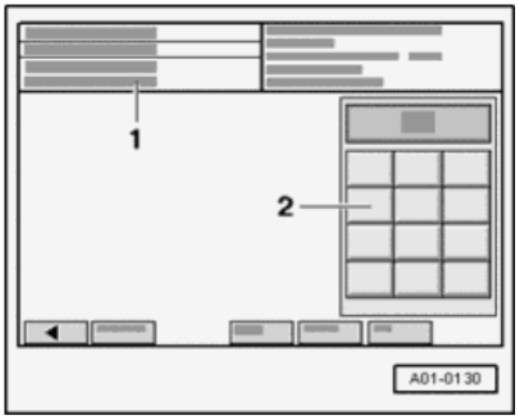

Fig. 61: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "030" for "display group number 030" in zone -2- and confirm entry by pressing -Q- button.

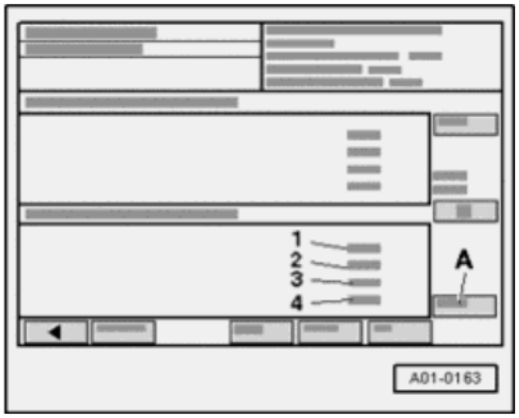

Fig. 62: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Check indication in display fields -1- and -2-.

NOTE:

- **By increasing the engine speed (RPM) the specified values are achieved quicker.**
- **The "Oxygen sensor status" indicates the condition of the oxygen sensor control and the oxygen sensor (O2S).**

	Display zones			
	1	2	3	4
Display group 030: Oxygen sensor status				
Display	**X X X**	**X X X**		
Display	**Oxygen sensor status, bank 1, sensor 1**	**Oxygen sensor status, bank 2, sensor 1**		
Range	**0 = off** **1 = on**	**0 = off** **1 = on**		
Specified value	**1 1 1**	**1 1 0**		

Significance of 3-digit readout of display group 030			
X	X	X	**Display zones 1 and 2:**
		X	Oxygen sensor control 0 = not active; 1 = active
	X		Oxygen sensor condition: 0 = not active; 1 = active

X			Condition of oxygen sensor heating: 0 = not active; 1 = active

NOTE:

- **The first digit of the 3-digit display (heating) fluctuates between 0 and 1 at certain operating points.**
- **The oxygen sensor control of oxygen sensor (O2S) after Three Way Catalytic Converter (TWC) (bank 1, sensor 2) is not active without engine load, i.e. the display of the 3-digit display is 0.**

  - Only continue with test if displays have reached "111" in display zone 1 and "110" in display zone 2 at least once.
  - Press <-- button.
  - Perform next operation.

Operation 6: Diagnosis of oxygen sensor control system before Three Way Catalytic Converter (TWC)

Conditions

- Engine at idle

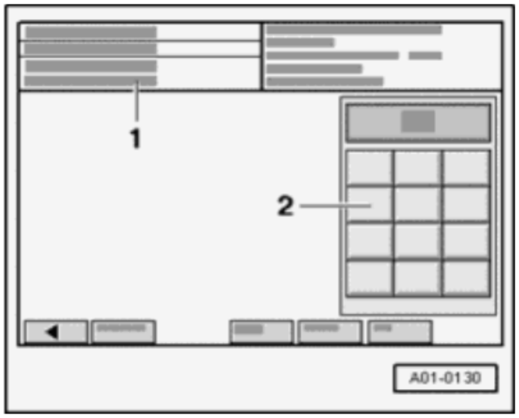

Fig. 63: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

  - Enter "107" for "display group number 107" in zone -2- and confirm entry by pressing -Q- button.

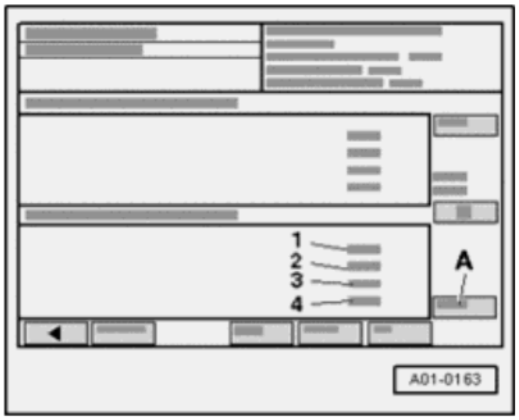

Fig. 64: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Check indication in display field -4-.

	Display zones			
	1	2	3	4
Display group 107: Diagnosis, oxygen sensor control system (bank 1, sensor 1)				
Display	xxxx rpm	x.x %		---
Display	Engine speed	Oxygen sensor control bank 1, sensor 1		Diagnosis status
Range				**Test OFF** **Test ON** **Syst. OK** **Syst. NOK**
Specified value	700...860 rpm	-8...8%		Syst. OK
			If "Syst. NOK" is displayed: Check DTC memory. Refer to **Diagnostic Trouble Code (DTC) memory, checking**	

If specification "Syst. OK" is obtained:

- Press <-- button.
- Abruptly floor accelerator pedal and release again (brief burst of throttle). 3000 rpm, then perform next operation.

CAUTION: The test procedure cannot continue successfully without this brief burst of throttle.

Operation 7: Diagnosis of aging of Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC)

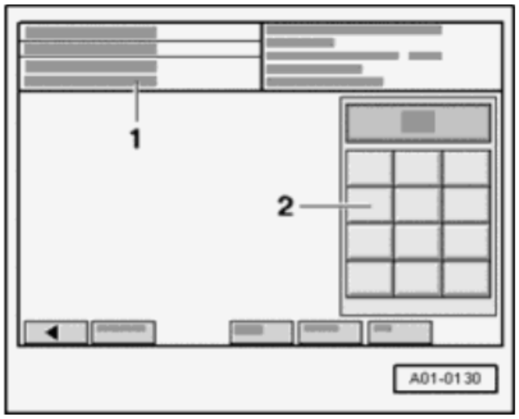

Fig. 65: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "034" for "display group number 034" in zone -2- and confirm entry by pressing -Q- button.

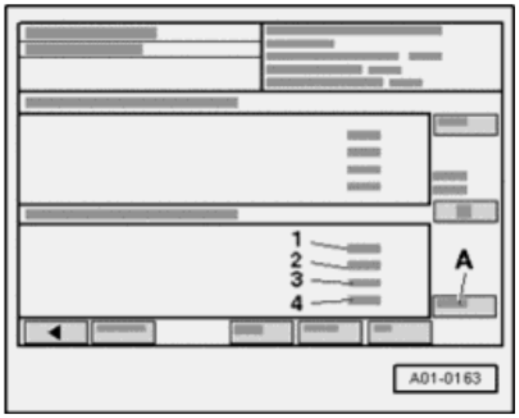

Fig. 66: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Press accelerator and brake pedal simultaneously, engine speed increases to approx. 2300 rpm.

Conditions

- Accelerator and brake pedal pressed simultaneously, engine runs at approx. 2300 rpm.

- Check indication in display field -4-.

	Display zones			
	1	2	3	4
Display group 034: Diagnosis, oxygen sensor aging (bank 1, sensor 1)				
Display	xxxx rpm	xxx ° C	x.x	**---**
Display	Engine speed	Exhaust gas temperature	Dynamics factor	Diagnosis status
Range				Test OFF Test ON B1-P1 OK B1-P1 NOK
Specified value	approx. 2300 rpm	Above 350 ° C	0.5...2.5	B1-P1 OK
			If "B1-P1 NOK" is displayed: Check Diagnostic Trouble Code (DTC) memory. Refer to **Diagnostic Trouble Code (DTC) memory, checking**	

If specification "B1-P1 OK" is obtained:

- Press <-- button.
- Perform next operation.

Operation 8: Diagnosis of Oxygen Sensor (O2S) condition after Three Way Catalytic Converter (TWC)

Conditions

- Engine at idle

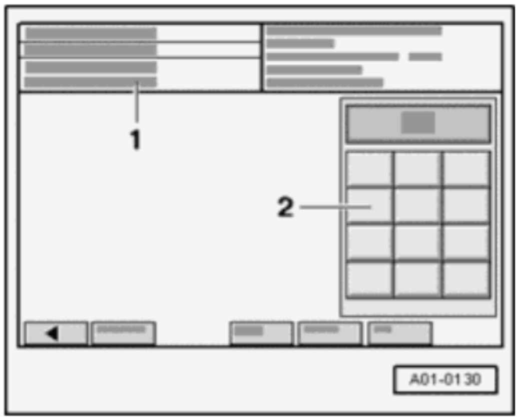

Fig. 67: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "036" for "display group number 036" in zone -2- and confirm entry by pressing -Q- button.

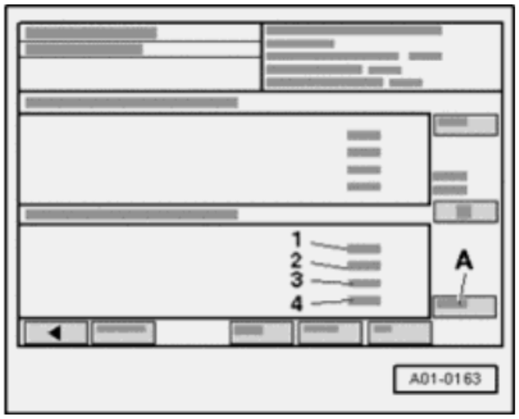

Fig. 68: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Check indication in display field -2-.

	Display zones			
	1	2	3	4
Display group 036: Oxygen sensor condition (bank 1, sensor 2)				
Display	x.xxx V	---		
Display	Oxygen sensor	**Diagnosis status**		

	voltage, bank 1, sensor 2			
Range		**Test OFF** **Test ON** **B1-P2 OK** **B1-P2 NOK**		
Specified value	0.100...0.950 volts	**B1-P2 OK**		
	If "B1-P2 NOK" is displayed: Check Diagnostic Trouble Code (DTC) memory. Refer to **Diagnostic Trouble Code (DTC) memory, checking**			

If specification "B1-P2 OK" is obtained:

- Press <-- button.
- Perform next operation.

Operation 9: Diagnosis of oxygen sensor control system after Three Way Catalytic Converter (TWC)

Conditions

- Engine at idle

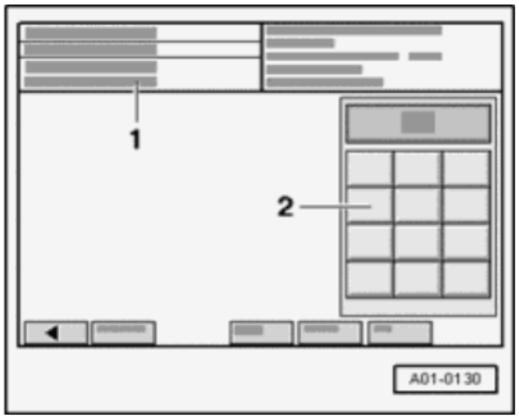

Fig. 69: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "037" for "display group number 037" in zone -2- and confirm entry by pressing -Q- button.

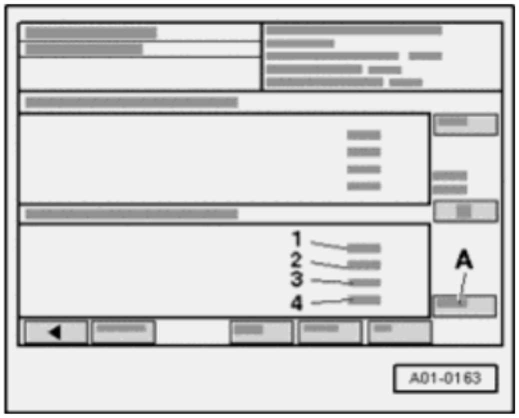

Fig. 70: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Check indication in display field -4-.

	Display zones			
	1	2	3	4
Display group 037: Diagnosis, oxygen sensor control system (bank 1, sensor 2)				
Display	xxx %	x.xxx V	x.xx	**---**
Display	Load	Oxygen sensor voltage, bank 1, sensor 2	Oxygen sensor correction value between bank 1, sensor 1 and bank 1, sensor 2	Diagnosis status
Range				**Test OFF** **Test ON** **Syst. OK** **Syst. NOK**
Specified value	13...45%	0.100...0.950 volts	-0.02...0.02	Syst. OK
			If "Syst. NOK" is displayed: Check Diagnostic Trouble Code (DTC) memory. Refer to **Diagnostic Trouble Code (DTC) memory, checking**	

If specification "Syst. OK" is obtained:

- Press <-- button.
- Perform next operation.

Operation 10: Diagnosis of Oxygen Sensor (O2S) aging after Three Way Catalytic Converter (TWC)

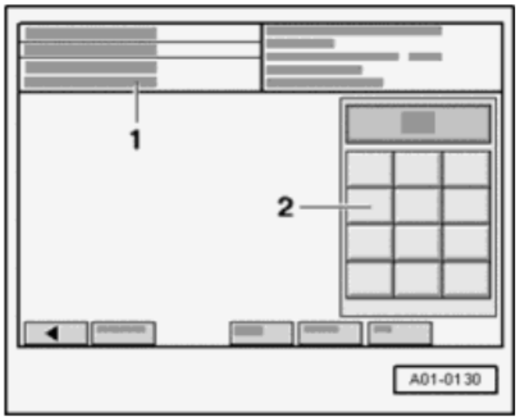

Fig. 71: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "043" for "display group number 043" in zone -2- and confirm entry by pressing -Q- button.

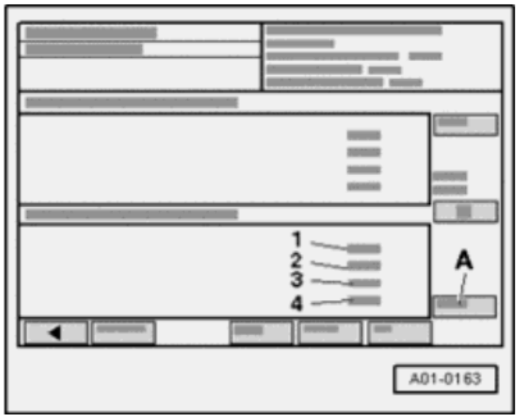

Fig. 72: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Press accelerator and brake pedal simultaneously, engine speed increases to approx. 2300 rpm.

Conditions

- Accelerator and brake pedal pressed simultaneously, engine runs at approx. 2300 rpm.

- Check indication in display field -4-.

	Display zones			
	1	2	3	4
Display group 043: Diagnosis, oxygen sensor aging (bank 1, sensor 2)				
Display	xxxx rpm	xxx ° C	x.xxx V	---
Display	Engine speed	Exhaust gas temperature	Oxygen sensor (O2S) voltage, bank 1, sensor 2	Diagnosis status
Range				Test OFF Test ON B1-P2 OK B1-P2 NOK
Specified value	approx. 2300 rpm	Above 350 ° C	0.100...0.950 volts	B1-P2 OK
			If "B1-S2 NOK" is displayed: Check Diagnostic Trouble Code (DTC) memory. Refer to **Diagnostic Trouble Code (DTC) memory, checking**	

If specification "B1-P2 OK" is obtained:

- Press <-- button.
- Perform next operation.

Operation 11: Three Way Catalytic Converter (TWC) diagnosis

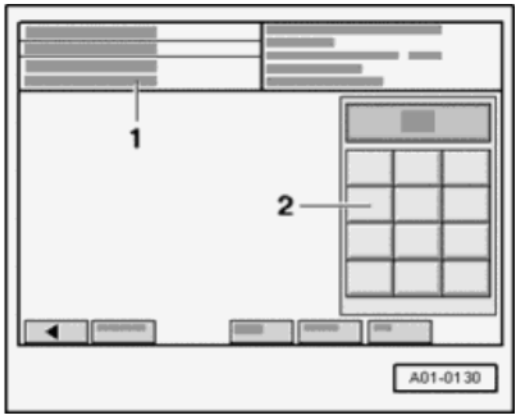

Fig. 73: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "046" for "display group number 046" in zone -2- and confirm entry by pressing -Q- button.

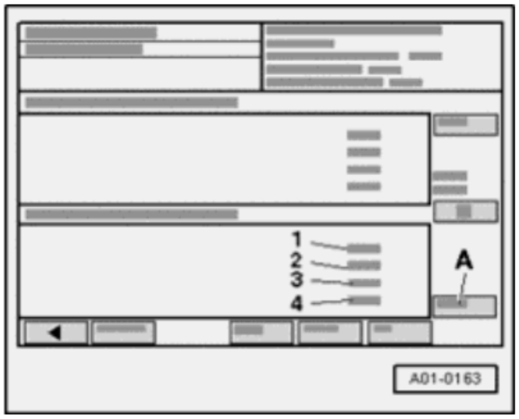

Fig. 74: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Press accelerator and brake pedal simultaneously, engine speed increases to approx. 2000 rpm.

Conditions

- Accelerator and brake pedal pressed simultaneously, engine runs at approx. 2000 rpm.

- Check specifications in display zones -2- and -4-.
- Check indication in display fields -2- and -4-.

	Display zones			
	1	2	3	4
Display group 046: Catalytic converter diagnosis (bank 1)				
Display	xxxx rpm	**xxx ° C**	x.xx	**---**
Display	Engine speed	**Exhaust gas temperature**	Measurement Catalytic conversion	Diagnosis status
Range				Test OFF Test ON Cat. B1 OK Cat. B1 NOK
Specified value	approx. 2000 rpm	**550...700 ° C**	Higher than 1.0	Cat. B1 OK
	As long as exhaust		If "Cat. B1 NOK" is	

	gas temperature is not within specified range test is not initiated. Increase or decrease speed, as necessary, leave basic setting to do so		displayed: Check Diagnostic Trouble Code (DTC) memory. Refer to **Diagnostic Trouble Code (DTC) memory, checking** . If no DTC is stored, replace the Three Way Catalytic Converter (TWC)	

If specification "Cat. B1 OK" is obtained:

- Press <-- button.
- Perform next operation.

Operation 12: Diagnosis of Evaporative Emission (EVAP) Canister Purge Regulator valve -N80-

Conditions

- Engine run at idle

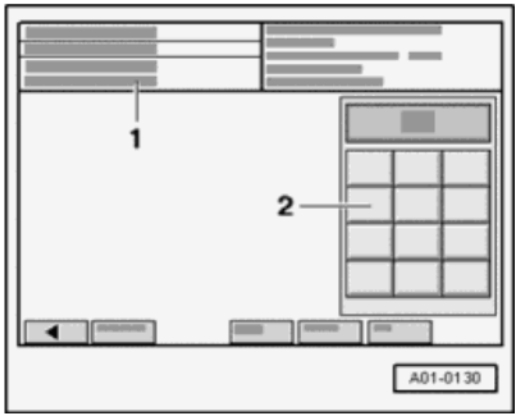

Fig. 75: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "070" for "display group number 070" in zone -2- and confirm entry by pressing -Q- button.

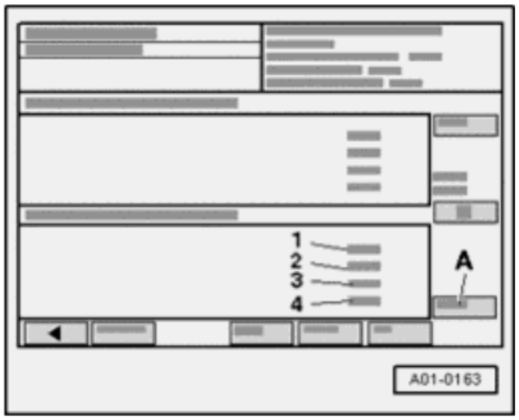

Fig. 76: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Check indication in display field -4-.

	Display zones			
	1	2	3	4
Display group 070: Diagnosis of Evaporative Emission (EVAP) Canister Purge Regulator valve				
Display	xx %	xx %		**---**
Display	Degree of opening of Evaporative Emission (EVAP) Canister Purge Regulator valve	Oxygen sensor control Mean value		**Diagnosis status**
Range				**Test OFF** **Test ON** **FTBV OK** **FTBV NOK** **Cancel**
Specified value	0...99%	< or = -7% or > or = 7%		**FTBV OK**
			If "EVAP NOK" is displayed: Check DTC memory. Refer to **Diagnostic Trouble Code (DTC) memory, checking** . Check EVAP Canister Purge Regulator valve -N80-. Refer	

			to **Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, checking**	

If specification "EVAP OK" is obtained:

- Press <-- button.
- Perform next operation.

Operation 13: Diagnostic of tank seal and Secondary Air Injection (AIR) system

Observe:

- Engine running at idle:

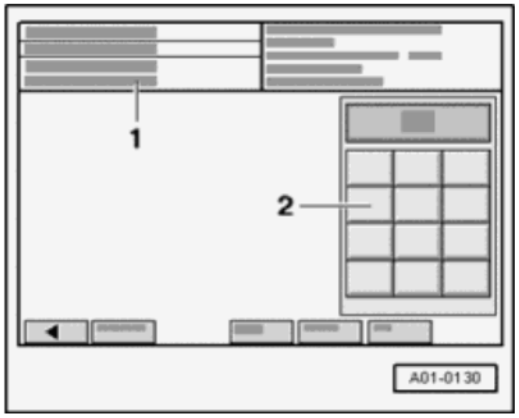

Fig. 77: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Select function "191" in button field -2- for "display group number 191" and press Q button to confirm input.

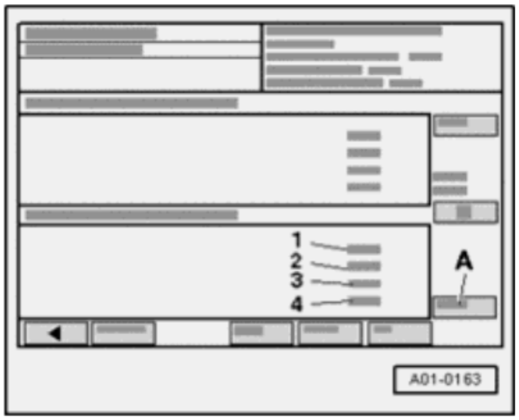

Fig. 78: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing button -A-.

NOTE:

- **During diagnostic of the Secondary Air Injection (AIR) system, the Secondary Air Injection (AIR) pump will run for several seconds.**
- **In case diagnostic leak test is not started, open fuel filler cap briefly (to release pressure).**

- Check indication in display fields -2- and -4-.

	Display fields			
	1	2	3	4
Display group 191: Tank seal and Secondary Air Injection (AIR) system (Bank 1) diagnostic				
Display	---	**---**	xx %	**---**
Indicated	Leak detection result	**Diagnostic condition**	Relative air mass bank 1, Secondary Air Injection (AIR) system	**Diagnostic condition**
Functional range		**Test OFF** **Test ON** **System OK** **System not OK**		**Test OFF** **Test ON** **System OK** **System not OK**
Specified value		**System OK**	More than -20%	**System OK**
Note		If "System not OK" is displayed: Check DTC memory. Refer to **Diagnostic Trouble Code (DTC) memory,**		If "System not OK" is displayed: Check DTC memory. Refer to **Diagnostic Trouble Code (DTC) memory,**

		checking		**checking**

If specified values "Syst. OK" are obtained:

- Click on <-- button
- Perform next work step.

Operation 14: Read readiness code

- Read readiness code. Refer to **Readiness code, reading**.

; Instrument panel; removing driver-side storage compartment ; Instrument panel; removing driver-side storage compartment ; Instrument panel; Driver-side storage compartment, removing

. .

ST - GENERIC SCAN TOOL

ON BOARD DIAGNOSTIC (OBD)

Generic Scan Tool (GST) Manual Contents

Included in the contents of this Generic Scan Tool (GST) manual is a summary table of the vehicle specific OBD II Emission Related Engine and Transmission DTCs. This table contains all necessary Malfunction Criteria, Threshold Values, Secondary Parameters, Enabling Conditions, Monitoring Time Length, Frequency of Checks, and Mil. Illumination to accurately monitor and diagnose the Engine Emissions and Transmission and perform all functions required to run Modes 01 through 09 with a hand held scan tool. For a further description of the monitor strategies, a document reference has been provided throughout this Generic Scan Tool (GST) manual and can be easily identified as. e.g. Bosch Motronic ME 7 OBD System Strategy.

This Generic Scan Tool (GST) manual also contains the step by step pin point test procedures to accurately diagnose and repair the suspected component or system once a DTC has been set. All references to repair procedures and wiring diagrams will be found within the diagnostic test procedure and easily identified as. e.g. --> **24 MULTIPORT FUEL INJECTION (MFI)** .

On Board Diagnostic (OBD) Systems

OBD II

OBD is an abbreviation for the On Board Diagnostic System.

California OBD-II applies to all gasoline engine vehicles up to 14,000 lbs. Gross Vehicle Weight Rating (GVWR) starting in the 1996 MY and all diesel engine vehicles up to 14,000 lbs. GVWR starting in the 1997 MY.

Several states in the Northeastern United States have chosen to adopt the California emission regulations starting in the 1998 MY and are known as "Green States".

Green States receive California-certified vehicles for passenger cars and light trucks up to 6,000 lbs. GVWR. Starting in the 2004 MY, Federal vehicle over 8,500 lbs. will start phasing in OBD-II.

Starting in 2004 MY, gasoline-fueled Medium Duty Passenger Vehicles (MDPVs) are required to have OBD-II. Federal OBD-II applies to all gasoline engine vehicles up to 8,500 lbs. GVWR starting in the 1996 MY and all diesel engine vehicles up to 8,500 lbs. GVWR starting in the 1997 MY.

OBD-II system implementation and operation is described in the remainder of this document.

Serial Data Link (MIL) Illumination

MIL is an abbreviation for the Malfunction Indicator Lamp (MIL).

If the Engine Control Module (ECM) recognizes a malfunction that leads to increased emissions values, it indicates them by lighting the Malfunction Indicator Lamp (MIL) which is located in the instrument cluster.

The Engine Control Module (ECM) switches on the Malfunction Indicator Lamp (MIL) after the ignition is switched on. Shortly after the engine is started, The Malfunction Indicator Lamp (MIL) goes out if the Engine Control Module (ECM) does not detect a malfunction that increases the emissions values.

If the Engine Control Module (ECM) recognizes a malfunction that leads to increased emissions during the operation of the engine, the Engine Control Module (ECM) switches on the Malfunction Indicator Lamp (MIL) and an entry is stored in the DTC memory of the Engine Control Module (ECM).

Controller Area Network (CAN) Data Link

CAN is an abbreviation for Controller Area Network.

The Engine Control Module (ECM) communicates with all databus capable control modules via a CAN Data Link.

The databus capable control modules (i.e. Engine Coolant temperature Sensor) are connected via two data bus wires which are twisted together (CAN_High and CAN_Low), and exchange information (messages) to the Engine Control Module (ECM). Missing information on the databus is then recognized and stored as a malfunction.

The Engine Control Module (ECM) illuminates the Malfunction Indicator Lamp (MIL) through the CAN data link and tells the Malfunction Indicator Lamp (MIL) to turn on, turn off, or blink.

Electronic Power Control (EPC) Warning Lamp

EPC is an abbreviation that stands for the Electronic Power Control (E-gas).

The Engine Control Module (ECM) monitors all EPC components after the ignition is switched on.

If a malfunction is recognized in the EPC system during the operation of the engine, the Engine Control Module (ECM) switches on the Electronic Power Control (EPC) Warning Lamp which is located in the instrument cluster and an entry is stored in the DTC memory of the Engine Control Module (ECM).

DIAGNOSTIC MODES

Diagnostic Modes Description

The information provided in Modes 01 through 09 displays the various levels of emission related data that may be monitored, as well as the ability to retrieve and read stored DTC trouble codes , erase stored DTC trouble codes, generate readiness codes, and select the various PIDs and OBDMIDs used within the modes to monitor the engine, and emission related component parameters.

The following table provides a link to all diagnostic modes that monitor all components and systems which influence the emission quality.

NOTE:

- **Depending on scan tool and protocol used, the information displayed may be referred to by different names such as OBDMID (TID), Hex-ID, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and be referenced by only a number.**

Selectable diagnostic modes
Mode 1: Obtain data --> **Diagnostic Mode 01: Obtain data** .
Mode 2: Obtain operating conditions --> **Diagnostic Mode 02: Obtain operating conditions** .
Mode 3: Interrogating fault memory --> **Mode 03: Interrogating fault memory** .
Mode 4: Reset/delete diagnostic data --> **Diagnostic Mode 04: Reset/delete diagnostic data** .
Mode 5: Obtain lambda test results --> **Diagnostic Mode 05: Check lambda test results** .
Mode 6: Checking test results of components that are not continuously monitored --> **Diagnostic Mode 06: Checking test results of components that are not continuously monitored** .
Mode 7: Checking test results of components that are continuously monitored --> **Diagnostic Mode 07: Check test results of components that are continuously monitored** .
Mode 8: Tank leak test --> **Diagnostic Mode 08: Tank leak test** .
Mode 9: Vehicle information --> **Diagnostic Mode 09: Vehicle information** .

Diagnostic Mode 01: Obtain data

Diagnostic Mode 01 is used to display and monitor all emissions related measured values.

Depending on scan tool and protocol used, the information displayed in diagnostic mode 01 may be referred to by different names such as OBDMID (TID), Hex-ID, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and be referenced by only a number.

Test requirement

- Coolant temperature at least 80°C.

Procedure

- Connect the scan tool.
- Start the engine and run at idle.
- Select "Diagnostic Mode 1: Obtain data.".
- From the following table, select the desired the "PID" that is to be monitored, e.g. "PID 05-Coolant temperature".

The current values of the component or system that is being monitored will be displayed on the scan tool screen.

PID	Component or System
01:	Monitoring status since erasing DTC memory
03:	Condition of fuel system

04:	Calculated load condition value
05:	Coolant temperature
06:	Short term gasoline-air ratio bank 1
07:	Gasoline-air ratio bank 1
12:	Engine rotations per minute (RPM)
13:	Vehicle speed
14:	Ignition timing adjustment at 1. cyl. in direction
15:	Intake air temperature (IAT)
16:	Air flow quantity at Mass Air Flow (MAF) sensor
17:	Throttle valve position (absolute)
19:	Existing oxygen B1 to B2-S2 to (exist./non exist.)
21:	Bank 1 - sensor 2
28:	OBD request is designed for diagnostic of this vehicle
31:	Time after engine on
33:	Driven distance after MIL on
35:	Fuel Rail Pressure
46:	Commanded Evaporative Purge
48:	Number of warm ups since diagnostic trouble codes
49:	Distance since diagnostic trouble codes cleared
51:	Barometric Pressure
52:	Bank 1 - sensor 1
56:	Bank 2- sensor 1
60:	Catalyst Temperature Bank 1, Sensor 1
65:	Monitor status this driving cycle
66:	Control module voltage
67:	Absolute Load Value
68:	Commanded Equivalence Ratio
69:	Relative Throttle Position
70:	Ambient air temperature
71:	Absolute Throttle Position B
73:	Accelerator Pedal Position D
74:	Accelerator Pedal Position E
76:	Commanded Throttle Actuator Control

- Switch the ignition off.
- **End of diagnosis.**

Diagnostic Mode 02: Obtain operating conditions

Diagnostic Mode 02 is used to monitor the operating conditions under which the Motronic Engine Control Module (ECM) J220 has detected and stored an emissions related DTC.

Depending on scan tool and protocol used, the information displayed in diagnostic mode 02 may be referred to by different names such as OBDMID (TID), Hex-ID, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and be referenced by only a number.

Procedure

- Connect the scan tool.
- Start the engine and run at idle.

NOTE:

- **If the engine does not start, crank the engine using starter for at least 5 seconds, do not switch the ignition off afterward under any circumstances.**

- Select "Diagnostic Mode 2: Obtain operating conditions.".
- From the following table, select the desired the "PID" , e.g. "PID 05-Coolant temperature" that is to be monitored.

The current values of the component or system that is being monitored will be displayed on the scan tool screen.

PID	Component or System
02:	DTC which triggered the current reception of all control module information
03:	Condition of fuel system
04:	Calculated load condition value
05:	Coolant temperature
06:	Short term gasoline-air ratio bank 1
07:	Gasoline-air ratio bank 1
12:	Engine rotations per minute (RPM)
13:	Vehicle speed
14:	Ignition timing adjustment at 1. cyl. in direction
15:	Intake air temperature (IAT)
16:	Air stream amount at Mass Air Flow (MAF) sensor
17:	Throttle valve position (absolute)
31:	Time after engine on
35:	Fuel Rail Pressure
46:	Commanded Evaporative Purge
51:	Barometric Pressure
66:	Control module voltage
67:	Absolute Load Value
68:	Commanded Equivalence Ratio
69:	Relative Throttle Position
70:	Ambient air temperature

71:	Absolute Throttle Position B
73:	Accelerator Pedal Position D
74:	Accelerator Pedal Position E
76:	Commanded Throttle Actuator Control

- Switch the ignition off.
- **End of diagnosis.**

Mode 03: Interrogating fault memory

Description

When the Engine Control Module (ECM) recognizes an emission related fault it turns on the Malfunction Indicator Lamp (MIL) or if a Electronic Throttle Malfunction is recognized, the Engine Control Module (ECM) turns on the Electronic Power Control (EPC) Warning Lamp which are both located in the instrument cluster.

Diagnostic Mode 03 is used to retrieve and view any DTC which may be stored in the Engine Control Module (ECM).

The DTCs are sorted by SAE code with the DTC tables consisting of a 5-digit alpha-numeric value.

Depending on scan tool and protocol used, the information displayed in diagnostic mode 03 may be referred to by different names such as OBDMID (TID), Hex-ID, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and be referenced by only a number.

The following tables provide a breakdown and explanation of the DTC code.

P-Codes

Component group					
P	x	x	x	x	DTC for the drivetrain
Norm-Code					
P	0	x	x	x	Trouble codes defined by SAE with specified malfunction texts
P	1	x	x	x	Additional emission relevant DTCs provided by the manufacturer
P	2	x	x	x	DTCs defined by SAE with

					specified texts, from MY 2000
P	3	x	x	x	Additional emission relevant DTCs provided by the manufacturer from MY 2000

Component group					
P	x	0	x	x	Fuel and air mixture and additional emission regulations
P	x	1	x	x	Fuel and air ratios
P	x	2	x	x	Fuel and air ratios
P	x	3	x	x	Ignition system
P	x	4	x	x	Additional exhaust system
P	x	5	x	x	Speed and idle control
P	x	6	x	x	Control module and output signals
P	x	7	x	x	Transmission
P	x	8	x	x	Transmission
P	x	9	x	x	Control modules, input and output signals

U-Codes

Component group					
U	x	x	x	x	DTC for network (CAN bus)
Norm-Code					
U	0	x	x	x	Trouble codes defined by SAE with specified

					malfunction texts

Interrogating the Fault Memory

Procedure

- Connect the scan tool.
- Switch the ignition to the "ON" position.
- Select "Diagnostic Mode 03: Interrogating fault memory ".
- The stored DTC or DTCs will be displayed on the scan tool screen.

The following table is an example of the DTC information that may be displayed on the scan tool screen:

Indication example	Explanation
P0444	SAE Diagnostic Trouble Code (DTC)
Evaporative Emission (EVAP) Canister Purge Regulator Valve	Malfunctioning wiring path or malfunctioning component
Circuit Open	Malfunction type as next

- Refer to the following DTC tables for the diagnostic repair procedure:

- SAE P0xxxDTCs --> **SAE P0xxx-DTCs** .
- SAE P1xxx-DTCs --> **SAE P1xxx-DTCs** .
- SAE P2xxxDTCs --> **SAE P2xxx-DTCs** .
- SAE P3xxxDTCs --> **SAE P3xxx-DTCs** .

- Switch the ignition off.
- **End of diagnosis.**

Diagnostic Mode 04: Reset/delete diagnostic data

Diagnostic Mode 04 is used to reset or delete the following stored information:

- All emission related malfunctions in the DTC memory.
- The operating conditions at which a malfunction was stored will be reset.
- All adaptation values.
- The test results of all diagnostic functions.

Depending on scan tool and protocol used, the information displayed in diagnostic mode 04 may be referred to by different names such as OBDMID (TID), Hex-ID, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and be referenced by only a number.

Procedure

- Connect the scan tool.
- Switch the ignition on.
- Select "Diagnostic Mode 03: Interrogating fault memory ".
- Then select "Mode 4: Reset/delete diagnostic data".

The scan tool will display: "Diagnostic data are being erased".

- Switch the ignition off.
- **End of diagnosis.**

Diagnostic Mode 05: Check lambda test results

Diagnostic Mode 05 allows access to the Oxygen Sensor test results. Mode 05 is divided into test identifiers (TIDS).

The values of the individual test results must reach the specified value or must be within the min. and max. limits.

Depending on scan tool and protocol used, the information displayed in diagnostic mode 05 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and be referenced by only a number.

Test requirements

- Exhaust system must be properly sealed between the catalytic converter and the cylinder heads.
- No DTCs stored in the DTC memory.
- Coolant temperature at least 80°C.

Work procedure

- Connect the scan tool.
- Start the engine and run at idle.

NOTE:

- **If the engine does not start, crank the engine using starter for at least 5 seconds, do not switch the ignition off afterward under any circumstances.**

- Select "Mode 5: Check lambda test results.".
- Select the desired "Test-ID" of the component or system that is to be monitored, e.g. "Test-ID 08: Oxygen Sensor Monitor Bank 1 - Sensor 1".
- Select the desired "Test-ID".

The current minimum and maximum values will be displayed on the scan tool screen.

The following table is a numerical list of all "Test-IDs" or "Hex-IDs" that may be selected.

Test-ID (Hex-ID)	Component or System
"Test A" : *: Test results for Oxygen Sensor Monitor Bank 1 - Sensor 1* under **Diagnostic Mode 05: Check lambda test results**	Test results for Oxygen Sensor In Front of Catalytic Converter Bank 1 - Sensor 1
"Test A" : *: Test results for Oxygen Sensor Monitor Bank 1- Sensor 2* under **Diagnostic Mode 05: Check lambda test results**	Test results for Oxygen Sensor Behind Catalytic Convertor Bank 1 - Sensor 2

"Test A" : Test results for Oxygen Sensor Monitor Bank 1 - Sensor 1

- Connect the scan tool.
- Start the engine and run at idle.
- Select "Mode 5: Check lambda test results".

Select "Test A".

- Select the desired "Test-ID (TID)" or "Hex-ID".
- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
129 ($81)	---	Oxygen Sensor actual Value	---	---	No DTC
120 ($82)	---	Oxygen Sensor specified Value	---	---	No DTC
131 ($83)	P0133	Response Check.	---	0.7 seconds	Refer to DTC P0133 in the DTC table **P0133** .
132 ($84)	P1176	Rationality Check.			Refer to DTC P1176 in the DTC table **P1176** .

- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTCs or the corresponding diagnostic repair procedure --> **Mode 03: Interrogating fault memory** .
- Switch the ignition off.
- **End of diagnosis.**

"Test B" : Test results for Oxygen Sensor Monitor Bank 1- Sensor 2

- Connect the scan tool.
- Start the engine and run at idle.
- Select "Mode 5: Check lambda test results".

Select "Test B".

- Select the desired "Test-ID (TID)" or "Hex-ID".
- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
01 ($01)	No DTC	Voltage from rich to lean			
02 ($02)	No DTC	Voltage from lean to rich			
07 ($07)	No DTC	Sensor voltage value	0 mV	450 mV	
08 ($08)	P0138	Short to Battery Check.	0 V	> 1.08 V	Refer to DTC P0138 in the DTC summary table. **P0138** .

- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTCs or the corresponding diagnostic repair procedure -> **Mode 03: Interrogating fault memory** .
- Switch the ignition off.
- **End of diagnosis.**

Diagnostic Mode 06: Checking test results of components that are not continuously monitored

Diagnostic Mode 06 displays the test results of emission related components and systems which are not continuously monitored.

The values of the individual test results must reach the specified value or must be within the min. and max. limits.

Depending on scan tool and protocol used, the information displayed in diagnostic mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and be referenced by only a number.

Test requirements

- Exhaust system must be properly sealed between the catalytic converter and the cylinder heads.
- No DTCs stored in the DTC memory.

- Coolant temperature at least 80°C.

Work procedure

- Connect the scan tool.
- Start the engine and run at idle.

NOTE:

- **If the engine does not start, crank the engine using starter for at least 5 seconds, do not switch the ignition off afterward under any circumstances.**

- Select "Mode 6: Check test the results of components that are not continuously monitored".
- Select the desired "Test-ID" of the component or system that is to be monitored, e.g. "Test-ID 01: Oxygen Sensor Monitor Bank 1 - Sensor 1".
- Select the desired "Test-ID".

The current minimum and maximum values will be displayed on the scan tool screen.

The following table is a numerical list of all "Test-IDs" or "Hex-IDs" that may be selected.

Test-ID (Hex-ID)	**Component or System**
01 ($01): *TID 01 ($01): Catalytic Conversion (Bank 1)* under **Diagnostic Mode 06: Checking test results of components that are not continuously monitored**	Catalytic Conversion (Bank 1)
02 ($02): *TID 02 ($02): Oxygen Sensor Bank 1- Sensor 1* under **Diagnostic Mode 06: Checking test results of components that are not continuously monitored**	Oxygen Sensor Bank 1- Sensor 1
03 ($03) *TID 03 ($03): Secondary Air Injection (AIR) System* under **Diagnostic Mode 06: Checking test results of components that are not continuously monitored**	Secondary Air Injection (AIR) System
05 ($05): *TID $05 (05): Tank Ventilation System, Tank Vent Valve Function* under **Diagnostic Mode 06: Checking test results of components that are not continuously monitored**	Tank Ventilation System, Tank Vent Valve Function
05 ($05): *TID $05 (05): Tank Ventilation System, Tank Leak Test* under **Diagnostic Mode 06: Checking test results of components that are not continuously monitored**	Tank Ventilation System, Tank Leak Test

TID 01 ($01): Catalytic Conversion (Bank 1)

- Connect the scan tool.
- Start the engine and run at idle.
- Select "Mode 6: Check test the results of components that are not continuously monitored".

Select "Test-ID 01 ($01) ".

- Select the desired "Component-ID (CID)" or "Hex-ID".
- Check specified values at idle.

Component-ID (CID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
05 ($05)	P0420	Conversion Capability (storage) Check.	---	> 2	Refer to DTC P0420 in the OBD DTC Summary Table for all monitoring values. **P0420** .
07($07)	P0420	Conversion Capability (storage) Check.	---	> 2	Refer to DTC P0420 in the OBD DTC Summary Table for all monitoring values. **P0420** .
08($08)	P0420	Conversion Capability (storage) Check.	---	> 2	Refer to DTC P0420 in the OBD DTC Summary Table for all monitoring values. **P0420** .

- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTCs or the corresponding diagnostic repair procedure -> **Mode 03: Interrogating fault memory** .
- Switch the ignition off.
- **End of diagnosis.**

TID 02 ($02): Oxygen Sensor Bank 1- Sensor 1

- Connect the scan tool.
- Start the engine and run at idle.
- Select "Mode 6: Check test the results of components that are not continuously monitored".

Select "Test-ID 02 ($02)".

- Select the desired "Component-ID (CID)" or "Hex-ID".
- Check specified values at idle.

Component-ID (CID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
01($01)	P0133	Response check.	---	0.7 seconds	Refer to DTC P0133 in the OBD DTC Summary Table. **P0133** .

- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTCs or the corresponding diagnostic repair procedure -> **Mode 03: Interrogating fault memory** .
- Switch the ignition off.
- **End of diagnosis.**

TID 03 ($03): Secondary Air Injection (AIR) System

- Connect the scan tool.
- Start the engine and run at idle.
- Select "Mode 6: Check test the results of components that are not continuously monitored".

Select "Test-ID 03 ($03) ".

- Select the desired "Component-ID (CID)" or "Hex-ID".
- Check specified values at idle.

Component-ID (CID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
01 ($01)	P0411	Secondary Air Injection (AIR) System test.	---	18%	Refer to DTC P0411 in the OBD DTC Summary Table for all monitoring values. **P0411** .
02 ($02)	P0411	Secondary Air Injection (AIR) System test.	---	18%	Refer to DTC P0411 in the OBD DTC Summary Table for all monitoring

					values. **P0411** .
09 ($09)	P0411	Secondary Air Injection (AIR) System test.	---	18%	Refer to DTC P0411 in the OBD DTC Summary Table for all monitoring values. **P0411** .

- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTCs or the corresponding diagnostic repair procedure --> **Mode 03: Interrogating fault memory** .
- Switch the ignition off.
- **End of diagnosis.**

TID $05 (05): Tank Ventilation System, Tank Vent Valve Function

- Connect the scan tool.
- Start the engine and run at idle.
- Select "Mode 6: Check test the results of components that are not continuously monitored".

Select "Test-ID 05($05)".

- Select the desired "Component-ID (CID)" or "Hex-ID".
- Check specified values at idle.

Component-ID (CID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
04 ($04)	No DTC	Tank Ventilation Valve Check.	5-10%	---	---
05 ($05)	No DTC	Tank Ventilation Valve Check.	5-10%	---	---
06 ($06)	No DTC	Tank Ventilation Valve Check.	5-10%	---	---
07 ($07)	P0441	Fuel Tank Leak Test.	5.5%	> 9.4 %	Refer to DTC P0441 in the OBD DTC Summary Table. **P0441** .

- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTCs or the corresponding diagnostic repair procedure --> **Mode 03: Interrogating fault memory** .
- Switch the ignition off.

- **End of diagnosis.**

TID $05 (05): Tank Ventilation System, Tank Leak Test

- Connect the scan tool.
- Start the engine and run at idle.
- Select "Mode 6: Check test the results of components that are not continuously monitored".

Select "Test-ID 05 ($05)".

- Select the desired "Component-ID (TID)" or "Hex-ID".
- Check specified values at idle.

Component-ID (CID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
0D ($13)	P0442	Pressure Check. Small leak test.	---	1.85-2.05 seconds	Refer to DTC P0442 in the OBD DTC Summary Table. **P0442** .
0D ($13)	P0455	Pressure Check. Large leak test.	---	0.95 seconds	Refer to DTC P0455 in the OBD DTC Summary Table **P0455** .
11 ($17)	P0456	Pressure Check. Pinhole leak test.	---	2.05-7 seconds	Refer to DTC P0456 in the OBD DTC Summary Table **P0456** .

- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTCs or the corresponding diagnostic repair procedure --> **Mode 03: Interrogating fault memory** .
- Switch the ignition off.
- **End of diagnosis.**

Diagnostic Mode 07: Check test results of components that are continuously monitored

Diagnostic Mode 07 displays all stored DTCs of emission related components and systems which are continuously monitored.

NOTE:

- **Depending on scan tool and protocol used, diagnostic mode 07 and the information provided may be referred to by a different name.**

Test requirements

- No DTCs stored in the DTC memory.
- Coolant temperature at least 80°C.

Procedure

- Connect the scan tool.
- Start the engine and run at idle.

NOTE:

- **If the engine does not start, crank the engine using starter for at least 5 seconds, do not switch the ignition off afterward under any circumstances.**

- Select "Mode 7: Check test results of components that are continuously monitored".

The number of stored DTCs or "0 malfunctions detected" will be displayed scan tool screen.

- Switch the ignition off.
- Refer to the following DTC tables for the diagnostic repair procedure:

- SAE P0xxxDTCs --> **SAE P0xxx-DTCs** .
- SAE P1xxx-DTCs --> **SAE P1xxx-DTCs** .
- SAE P2xxxDTCs --> **SAE P2xxx-DTCs** .
- SAE P3xxxDTCs --> **SAE P3xxx-DTCs** .

- Switch the ignition off.
- **End of diagnosis.**

Diagnostic Mode 08: Tank leak test

Diagnostic Mode 08 is used to test the fuel system for leaks.

NOTE:

- **Depending on scan tool and protocol used, diagnostic mode 08 and the information provided may be referred to by a different name.**

NOTE:

- **If the accelerator pedal is depressed during the test, the test will be aborted.**

Test requirements

- No DTCs stored in the DTC memory.
- Intake Air Temperature (IAT) maximum 60°C.

- Coolant temperature 80 -110°C.
- Throttle valve angle 12.0 - 16.0%.

Procedure

- Connect the scan tool.
- Start the engine and run at idle for at least 15 minutes.
- Select "Mode 8: Tank Leak Test".
- Select "OBDMID 01: Tank Leak Test".

- Check the specified value of the tank leak test at idle.
- The following will be displayed on the scan tool screen:

Tank leak test	**Specified value**
• Test function active • Test function is being initiated, please wait • Test off • Test aborted	Test OK

- Switch the ignition off.

If the specified value is obtained:

- Refer to "Diagnostic mode 03: Interrogating fault memory " to check for any DTCs that may be stored --> **Mode 03: Interrogating fault memory** .
- To repeat the tank test, switch the ignition off and start the engine again and let run for 15 minutes at idle.
- Switch the ignition off.
- **End of diagnosis.**

Diagnostic Mode 09: Vehicle information

NOTE:

- **For all calibration and immobilizer information. Refer to the EBAHN-Website.**

Diagnostic Mode 09 is used to display vehicle specific information, e.g. the different Engine Control Module (ECM) versions.

NOTE:

- **Depending on scan tool and protocol used, diagnostic mode 09 and the information provided may be referred to by a different name.**

Test requirement

- No DTCs stored in the DTC memory.

Procedure

- Connect the scan tool.
- Switch the ignition on.
- Select "Mode 09: Vehicle information".
- Select the desired "OBDMID".

- The information requested will be displayed on the scan tool screen.

The following table is a numerical list of all "OBDMIDs" that may be selected.

OBDMID	Diagnostic text
02:	Vehicle identification number e.g.
	• A different 17 digit number will be displayed for each vehicle
04:	Calibration identification e.g.
	• Engine Control Module (ECM)
	• Transmission Control Module (TCM)
06:	CVN (check sum) e.g.
	• EC5AE460 the check sum is different for every control module version
	• 000D105

- Switch the ignition off.
- **End of diagnosis.**

READINESS CODE

Readiness Code Description

Diagnostics are performed at regular intervals during normal vehicle operation. After repairing an emissions related system, a readiness code is generated by road testing the vehicle.

If a malfunction is recognized during the drive cycle, it will be stored in the DTC memory.

The OBD drive cycle operation will be monitored with a hand held diagnostic tool. Consult the manufacturers instruction manual for correct tool operation.

The readiness code is erased every time the DTC memory is erased or any time the battery is disconnected. If the DTC memory has been erased or the battery is disconnected, a new readiness code must be generated.

Only erase the DTC memory if a DTC has been stored.

General Recommendations

Most monitors will complete easier and quicker using a steady-foot and smooth acceleration during the drive cycle operation, cruise, and acceleration modes.

Operating Conditions

For the EVAP monitor test, the coolant temperature and the ambient air temperature must be between 10°C and 35°C with a difference between them no greater than 4°C. The ambient air temperature must not change more than 4°C during the drive cycle procedure (e.g. when driving out of a heated workshop in the winter).

Test requirements

- Erase the DTC memory --> **Diagnostic Mode 04: Reset/delete diagnostic data** .
- Coolant temperature must be between 80°C - 110°C.
- The Intake Air Temperature (IAT) must be between 10°C - 35°C.
- Battery voltage must be a minimum of 12.5 volts.

- Fuel tank level 1/4 - 3/4 full.

CAUTION: When performing the drive cycle operation, pay strict attention to driving conditions and please observe and obey all posted speed limits. Failure to follow these instructions may result in personal injury or possible death.

Drive Cycle Procedure

- Connect the scan tool.
- Switch the ignition on and start the vehicle.
- Idle the vehicle for 2-3 minutes. This executes the O2S Heater, Misfire, Secondary AIR, Fuel Trim, and Purge system monitors.
- Drive the vehicle at 45-55 mph for a continuous 7 minute period, avoid stopping. This executes the EVAP, O2S, Fuel Trim, and Misfire monitors.

- Accelerate the vehicle to an engine speed of 5000 RPM (with automatic transmission use the tip-tronic mode); lift off the throttle until the engine speed is around 1200 rpm. This executes the fuel cut off
- Accelerate the vehicle smoothly to 60-65 mph, cruise constantly for 5 min, this executes the Catalyst; O2S, Misfire, Fuel Trim, and Purge System monitors.
- Decelerate and idle the vehicle again for 3 minutes. This executes the Misfire, Secondary AIR, Fuel Trim, and Purge system monitors.
- Check the status of the readiness code.

NOTE:

- **Depending on the scan tool used. The readiness code status may be displayed as complete, passed or OK.**

- If any engine monitor fails the drive cycle test. Repeat the drive cycle test until all engine monitors have successfully run through and passed.

NOTE:

- **When repeating the drive cycle operation for a failed EVAP monitor or thermostat-monitor, allow the engine to cool until the coolant temperature and the ambient air temperature are be between 10°C - 35°C with a difference between them no greater than 4°C is observed and repeat the drive cycle operation.**

If the drive cycle operation fails again.

- Check the DTC memory for stored DTCs --> **Mode 03: Interrogating fault memory** .

Repair the vehicle if necessary.

- Repeat the drive cycle operation until all engine monitors have successfully run through and passed.
- Remove the scan tool and switch the ignition off.
- End of operation.

DIAGNOSTIC TROUBLE CODE (DTC) TABLES

SAE P0xxx-DTCs

Fuel and air ratios

Refer to: Bosch Motronic ME 7 OBD System Strategy; Comprehensive Components Monitoring

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length
P0010	A Camshaft Position Actuator Circuit	Check the Camshaft Adjustment Valve 1 N205. Refer to --> **Camshaft Adjustment Valve 1 N205 , checking** .	Short to battery positive->5.2 6.0 V Short to ground-0.5 1.0 V Open circuit-5.0 8.8 mA	Engine speed-80 rpm	0.5 Sec
P0011	A Camshaft Position Timing Over-Advanced or System Performance	Check the Camshaft Adjustment Valve 1 N205. Refer to --> **Camshaft**	Adjustment angle->6 degrees	Engine speed->520 rpm ECT->(-)44 - 143 degrees C Time	1.0 sec per driving cycle

		Adjustment Valve 1 N205 , checking .		after engine start-0 sec		
P0012	A Camshaft Position Timing Over-Retarded	○ Check the Camshaft Adjustment Valve 1 N205. Refer to --> **Camshaft Adjustment Valve 1 N205 , checking** .	Adjustment angle-16 degrees	Engine speed->720 rpm ECT->(-)9.75 degrees C Time after engine start->10 sec	1.5 sec	
P0030	HO2 Heater Control Circuit (Bank 1, Sensor 1)	○ Check the Oxygen Sensor (O2S) Heater Z19. Refer to --> **Oxygen Sensor (O2S) Heater Z19 before catalytic converter, checking** .	Open circuit-2.34 3.59 V	Sensor heater-OFF Time after engine start->4 sec Sensor heater-Heated up	0.5 Sec	
P0031	HO2 Heater Control Circuit Low (Bank 1, Sensor 1)	○ Check the Oxygen Sensor (O2S) Heater Z19. Refer to --> **Oxygen Sensor (O2S) Heater Z19 before catalytic converter, checking** .	Short to ground 2.34V	Sensor heater-OFF Time after engine start- >4 sec Sensor heater-Heated up	5 Sec	
P0032	HO2 Heater Control Circuit High (Bank 1, Sensor 1)	○ Check the Oxygen Sensor (O2S) Heater Z19. Refer to --> **Oxygen Sensor (O2S) Heater Z19 before catalytic converter, checking** .	Short to battery positive- 1%	Sensor heater-ON Air mass flow-> 32 kg/h Sensor heater-Heated up	5 Sec	
P0036	HO2S Heater Control Circuit (Bank 1, Sensor 2), electrical fault.	○ Check the Oxygen Sensor (O2S) Heater Z29. Refer to --> **Oxygen Sensor (O2S) 1 (behind Three Way Catalytic Converter (TWC)) Heater Z29 , checking** .	Open circuit-4.5 5.5 V	Sensor heater-OFF Engine speed->80 rpm	0.5 Sec	
P0037	HO2S Heater Control Circuit Low (Bank 1, Sensor 2), electrical fault.	○ Check the Oxygen Sensor (O2S) Heater Z29. Refer to --> **Oxygen Sensor (O2S) 1 (behind Three Way Catalytic Converter**	Short to ground-3.0 V	Sensor heater-OFF Engine speed- >80 rpm	5 Sec	

		(TWC)) Heater Z29 , checking .			
P0038	HO2S Heater Control Circuit High (Bank 1, Sensor 2), electrical fault.	○ Check the Oxygen Sensor (O2S) Heater Z29. Refer to --> **Oxygen Sensor (O2S) 1 (behind Three Way Catalytic Converter (TWC)) Heater Z29 , checking** .	Short to Battery Positive 2.7 5.5 A	Sensor heater-ON Engine speed->80 rpm	0.5 Sec
P0102	Mass or Volume Air Flow Circuit Low Input	○ Check the Mass Air Flow (MAF) Sensor G70. Refer to --> **Mass Air Flow (MAF) Sensor G70 , checking** .	Lower threshold map (depending on engine speed and throttle angle) Air mass: 3 159 kg/h	Time after engine start-200 camshaft revolutions	2 Sec
P0103	Mass or Volume Air Flow Circuit High Input	○ Check the Mass Air Flow (MAF) Sensor G70. Refer to --> **Mass Air Flow (MAF) Sensor G70 , checking** .	(ULEV) Upper threshold map (depending on engine speed and throttle angle) Air mass: 50 710 kg/h	Time after engine start-200 camshaft revolutions	2 Sec
P0106	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	○ Check the Charge Air Pressure Sensor G31. Refer to --> **Charge Air Pressure Sensor G31 , checking** .	Difference between altitude sensor and boost pressure ->200 mbar	---	---
P0112	Intake Air Temperature Sensor 1 Circuit Low	○ Check the Intake Air Temperature (IAT) Sensor 2 G299 . Refer to --> **Intake Air Temperature (IAT) G42 , checking** .	Short to ground 141.0 degrees C	Engine cranking range-120 320 rpm	2 Sec
P0113	Intake Air Temperature Sensor 1 Circuit High	○ Check the Intake Air Temperature (IAT) Sensor 2 G299 . Refer to --> **Intake Air Temperature (IAT) G42 , checking** .	Short to battery positive (-) 45.75 degrees C	Time after engine start-180 sec	2 Sec

P0116	Engine Coolant Temperature Sensor Circuit Range/Performance	○ Check the Engine Coolant Temperature (ECT) Sensor G62. Refer to --> **Engine Coolant Temperature (ECT) Sensor G2 , checking** . ○ Check the coolant regulator. Refer to --> **19 - ENGINE - COOLING SYSTEM** .	(LEV)Signal change3 K K (ULEV)Signal range-3 K	Engine temperature- >105 degrees C Engine heated up: Vehicle speed range-0 80 mph Mass air flow->40 52 kg/h (depending on speed) Time required/freq.- >10 sec/once and Engine cooling down: Vehicle speed range-40 80 mph mass air flow-28 52 kg/h (depending on speed) Time required/freq.- >15 sec/once Engine temperature- >112.5 degrees C Engine heated up: Vehicle speed range-0 80 mph Mass air flow->40 52 kg/h (depending on speed) Time required/freq.- >10 sec/once and Engine cooling down: Vehicle speed range-25 80 mph mass air flow-28 52 kg/h (depending on speed) Time required/freq.- >15 sec/once	>25 seconds/once per driving cycle 25 seconds	2 c c c
P0117	Engine Coolant Temperature Circuit Low	○ Check the Engine Coolant Temperature (ECT) Sensor G62.	(LEV) Short to ground ECT, >141°C		2 Sec	

		Refer to --> **Engine Coolant Temperature (ECT) Sensor G2 , checking** . ○ Check the coolant regulator. Refer to --> **19 - ENGINE - COOLING SYSTEM** .	(ULEV) Short to ground ECT, >141°C		
P0118	Engine Coolant Temperature Circuit High	○ Check the Engine Coolant Temperature (ECT) Sensor G62. Refer to --> **Engine Coolant Temperature (ECT) Sensor G2 , checking** . ○ Check the coolant regulator. Refer to --> **19 - ENGINE - COOLING SYSTEM** .	(LEV)Short to battery positive or open circuit- (-) 45.75 degrees C (ULEV)Short to battery positive- (-) 45.75 degrees C		2 sec 2 sec
P0121	Throttle/Pedal Position Sensor A Circuit Range/Performance	○ Check the Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185. Refer to --> **Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking (Engine Code AMB)** .	Not plausible signal: Comparison signal sensor vs- signal senor 2 and difference between signal 1 to calculated throttle angle > difference between signal 2 to calculated throttle angle- >6.3%	Engine speed- >1,320 rpm	0.2 Sec
P0122	Throttle/Pedal Position Sensor "A" Circuit Low Input	○ Check the Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185. Refer to --> **Throttle Position (TP) Sensor G79/Accelerator**	Lower threshold- 0.18 V		0.14 Sec

		Pedal Position Sensor 2 G185 , checking (Engine Code AMB) .			
P0123	Throttle/Pedal Position Sensor "A" Circuit High Input	○ Check the Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185. Refer to --> **Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking (Engine Code AMB)** .	Upper threshold > 4.63 V		0.14 Sec
P0130	O2 Sensor Circuit (Bank 1, Sensor 1) Malfunction	○ Check the Heated Oxygen Sensor (HO2S) G39. Refer to --> **Heated Oxygen Sensor (HO2S) G39 and oxygen sensor regulation before catalytic converter, checking** .	Gradient of O2 sensor signal, 2 V/ms Open circuit or no activity, Front O2 sensed l 0.995-1.005 Internal voltage high (ASIC) 3.7-4.8 V Internal voltage high (ASIC) >4.8 V Comparison signal front to rear sensor, Front O2 sensed lean l>1.04 and rear O2 signal >0.7 V Or Front O2 sensed rich l 0.96 and rear O2 signal >0.3 V	Time after engine start, >25 Sec Exhaust gas temp, >200°C Load change, 3% segment Sensor heater, active, Sensor, heated up Time after engine start, >25 Sec Air mass flow, >24 kg/h Rear o2 signal, >0.7 or 0.3 V Fuel cut off, not active Oxygen sensor, heated up Fuel cut off, not active Oxygen sensor, heated up l control, closed loop	0.13 seconds 5-25 seconds 10 seconds at low fuel level:6-10 Sec 2 sec 2-25 sec
P0133	O2 Sensor Circuit Slow Response (Bank 1, Sensor 1)	○ Check the Heated Oxygen Sensor (HO2S) G39. Refer to --> **Heated Oxygen Sensor (HO2S) G39**	Amplitude ration between sensor signal and stored value-0.7	Engine speed range-1,720 3,500 rpm Engine load range-33 52% Load change-	40 sec, once per driving cycle

		and oxygen sensor regulation before catalytic converter, checking .		4%/segment Fuel control-Closed loop	
P0135	O2 Sensor Heater Circuit	○ Check the Oxygen Sensor (O2S) Heater Z19. Refer to --> **Oxygen Sensor (O2S) Heater Z19 before catalytic converter, checking** .	No activity after engine start-1% No activity after fuel cut off-FRONT o2 sensor voltage-. 3 V	Sensor heater-ON Air mass flow->32 kg/h Sensor heater-Heated up Time after engine start->70 sec Sensor heater-ON Catalyst temperature-300°C P0133-No fault	20 sec, once per driving cycle 3 sec
P0136	O2 Sensor Circuit (Bank 1, Sensor 2)	○ Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130. Refer to --> **Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and oxygen sensor regulation behind catalytic converter, checking** .	(LEV) Open circuit- 400 500 mV	Sensor heated up-After 100 sec Catalyst temperature-> 50°C	600 Sec
P0137	O2 Sensor Circuit Low Voltage (Bank 1, Sensor 2)	○ Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130. Refer to --> **Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and oxygen sensor regulation behind catalytic converter, checking** .	(ULEV) Short circuit- 60 mV (LEV) Short circuit 60mV	Sensor heated up- After 100 sec Catalyst temperature->320°C Engine temperature @ engine OFF->60°C Engine temperature @ engine start- 40° C Sensor heated up- After 100 sec Catalyst temperature->320°C Engine temperature @ engine OFF->60°C Engine	100 sec at low fuel level: 700 sec 90 Sec at low fuel level: 700. Sec

				temperature @ engine start- 40° C	
P0138	O2 Circuit High Voltage (Bank 1, Sensor 2)	○ Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130. Refer to --> **Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and oxygen sensor regulation behind catalytic converter, checking** .	(ULEV) Short to battery +>1.3 V (LEV) Short to battery +> 1.3 V	Sensor heated up-After 100 sec. Catalyst temperature- >320°C Sensor heated up-After 100 sec. Catalyst temperature- >50°C	5 Sec
P0139	O2 Sensor Circuit Slow Response (Bank 1, Sensor 2)	○ Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130. Refer to --> **Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and oxygen sensor regulation behind catalytic converter, checking** .	(ULEV)Sensor signal not active-Signal output is oscillating at reference value 0.608 V (LEV) Signal output is oscillating at reference value 0.608 V	Intake air mass- 24 120kg/h Rear O2 sensor readiness- >30 sec Rear o2 sensor heater and electrical check-No DTC Catalyst temperature- >390°C Fuel cut off-Not active Intake air mass- 20 120kg/h Rear O2 sensor readiness- >30 sec Rear o2 sensor heater and electrical check-No DTC Catalyst temperature- >375°C Fuel cut off-Not active	100 Sec 100 Sec
P0140	O2 Sensor Circuit No Activity Detected (Bank 1, Sensor 2)	○ Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130. Refer to --> **Oxygen Sensor**	ULEV) Open sensor or no activity-400 500 mV (LEV) no activity-400 500 mV	Sensor heated up-After 100 sec Catalyst temperature- 320°C Sensor heated up-After 100 sec Catalyst	600 Sec 600 Sec

		(O2S) Behind Three Way Catalytic Converter (TWC) G130 and oxygen sensor regulation behind catalytic converter, checking .		temperature->50°C	
P0141	O2 Sensor Heater Circuit (Bank 1, Sensor 2), electrical fault.	○ Check the Oxygen Sensor (O2S) Heater Z29. Refer to --> **Oxygen Sensor (O2S) 1 (behind Three Way Catalytic Converter (TWC)) Heater Z29 , checking** .	(ULEV) Out of range, 0.5-38 ohms (Depending on catalyst temp.) (LEV) Out of range, .8-30 ohms (Depending on catalyst temp.)	Catalyst temperature,400-580°C Sensor heater, on Sensor heater, heated up IAT, >-7°C Catalyst temperature,300-600°C Sensor heater, on Sensor heater, heated up IAT, >-7°C	6 Sec 30 Sec
P0171	System Too Lean	○ Check the fuel pump delivery and quantity. Refer to --> **Fuel Pump (FP) delivery quantity, checking** . ○ Check the Fuel Pressure Sensor G247. ○ Check the fuel injectors N30, N31, N32, N33, N83. Refer to --> **Fuel Injectors N30, N31, N32, N33 , checking** . ○ Check the Heated Oxygen Sensor (HO2S) G39 Refer to --> **Heated Oxygen Sensor (HO2S) G39 and oxygen sensor regulation before catalytic converter, checking** . ○ Check the Oxygen	(additive) System too RICH->(-) 8% within adaptive range (multiplicative) System too RICH- > (-) 23% within adaptive range	Lambda controller-Closed loop Engine speed-1,000 rpm Mass air-22 kg/h Fuel adoption-Active and stable Purge valve-CLOSED ULEV: ECT or subst. Temperature->70 or >80°C LEV: ECT or subst. Temperature->60 70°C Lambda controller engine-CLOSED loop Engine load-12 60 % Mass air-34 450 kg/h Fuel adoption-Active and stable Purge valve-CLOSED	50 Sec 50 Sec

		Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130. Refer to --> **Oxygen Sensor (O2S) Heater Z19 before catalytic converter, checking** . ○ Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80. Refer to --> **Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 , checking (AMB Engine Code)** . ○ Check the intake system for leaks (false air). ○ Check the exhaust system for proper seal. ○ Check the vacuum lines for leaks		Engine speed-0 4,800 U/min ULEV: ECT or subst. Temperature->70 or >80°C LEV: ECT or subst. Temperature->60 70°C	
P0172	System Too Rich	○ Check the Fuel Pressure Sensor G247. ○ Check the fuel injectors N30, N31, N32, N33, N83. Refer to --> **Fuel Injectors N30, N31, N32, N33 , checking** . ○ Check the Heated Oxygen Sensor (HO2S) G39. Refer to --> **Heated Oxygen Sensor (HO2S) G39 and oxygen sensor**	(additive) System too RICH->(-) 8% within adaptive range (multiplicative) System too RICH-> (-) 23% within adaptive range	Lambda controller-Closed loop Engine speed-1,000 rpm Mass air-22 kg/h Fuel adoption-Active and stable Purge valve-CLOSED ULEV: ECT or subst. Temperature->70 or >80°C LEV: ECT or subst. Temperature->60 70°C	50 Sec 50 Sec

		regulation before catalytic converter, checking . ○ Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130. Refer to --> **Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and oxygen sensor regulation behind catalytic converter, checking** . ○ Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80. Refer to --> **Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 , checking (AMB Engine Code)** .		Lambda controller engine-CLOSED loop Engine load-12 60 % Mass air-34 450 kg/h Fuel adoption-Active and stable Purge valve-CLOSED Engine speed-0 4,800 U/min ULEV: ECT or subst. Temperature->70 or >80°C LEV: ECT or subst. Temperature->60 70°C	
P0201	Injector Circuit/Open - Cylinder 1	○ Check the fuel injectors N30. Refer to --> **Fuel Injectors N30, N31, N32, N33 , checking** .	Open circuit-4.5 5.5 V while injection valve is OFF	Engine speed-80 rpm	0.5 Sec
P0202	Injector Circuit/Open - Cylinder 2	○ Check the fuel injectors N31. Refer to --> **Fuel Injectors N30, N31, N32, N33 , checking** .	Open circuit-4.5 5.5 V while injection valve is OFF	Engine speed-80 rpm	+0.5 Sec
P0203	Injector Circuit/Open - Cylinder 3	○ Check the fuel injectors N32. Refer to --> **Fuel Injectors N30, N31, N32, N33 , checking** .	Open circuit-4.5 5.5 V while injection valve is OFF	Engine speed-80 rpm	+0.5 Sec
P0204	Injector Circuit/Open - Cylinder 4	○ Check the fuel	Open circuit-4.5 5.5 V while	Engine speed-80 rpm	+0.5 Sec

		injectors N33. Refer to --> **Fuel Injectors N30, N31, N32, N33 , checking** .	injection valve is OFF		
P0221	Throttle/Pedal Position Sensor/Switch B Circuit Range/Performance	○ Check the Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185. Refer to --> **Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking (Engine Code AMB)** .	Not plausible signal: Comparison signal sensor 2 vs- signal sensor 1 and difference between signal 2 to calculated throttle angle > difference between signal 1 to calculated throttle angle->6.3%	Engine speed->1,320 rpm	0.2 Sec
P0222	Throttle/Pedal Position Sensor/Switch B Circuit Low	○ Check the Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185. Refer to --> **Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking (Engine Code AMB)** .	Lower threshold-0.16 V	Engine speed->1,320 rpm	0.14 Sec
P0223	Throttle/Pedal Position Sensor/Switch B Circuit High	○ Check the Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185. Refer to --> **Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking (Engine Code AMB)** .	Upper threshold-4.8 V		0.14 Sec
P0230	Fuel Pump primary Circuit	○ Check Fuel Delivery System	Short to battery positive- 0.6 1.2 A Short to	Engine speed- >80 Rpm	0.5 Sec

		--> **Fuel Pump (FP) delivery quantity, checking**	ground- 3.0 V Open circuit- 4.5 5.5 V		
P0234	Turbocharger/Supercharger Overboost Condition	○ Check the Charge Air Pressure Sensor G31. Refer to --> **Charge Air Pressure Sensor G31 , checking** . ○ Check the charge air system for proper seal. Refer to --> **21 - TURBOCHARGER, G-CHARGER**	(Only ULEV) Actual pressure higher than model pressure-400 mbar	Engine speed- >2,400 - 3,000 Rpm	1.0 Sec
P0237	Turbocharger/Supercharger Boost Sensor "A" Range/Performance	○ Check the Charge Air Pressure Sensor G31. Refer to --> **Charge Air Pressure Sensor G31 , checking** . ○ Check the charge air system for proper seal. Refer to --> **21 - TURBOCHARGER, G-CHARGER**	Short to ground- >0.14 V		0.8 Sec
P0238	Turbocharger/Supercharger Boost Sensor "A" Circuit High	○ Check the Charge Air Pressure Sensor G31. Refer to --> **Charge Air Pressure Sensor G31 , checking** . ○ Check the charge air system for proper seal. Refer to --> **21 - TURBOCHARGER, G-CHARGER**	Short to battery positive- >4.88 V	---	0.8 Sec
P0243	Turbocharger/Supercharger Wastegate Solenoid "A"	○ Check the Wastegate Bypass Regulator Valve N75. Refer to --> **Wastegate Bypass Regulator Valve N75 , checking** .	(Only ULEV) Open circuit- 4.5 5.5 V	Valve-OFF Engine speed- >80 rpm	0.5 Sec
P0245	Turbocharger/Supercharger Wastegate Solenoid "A" Low	○ Check the Wastegate Bypass Regulator Valve N75. Refer to --> **Wastegate Bypass Regulator Valve**	(Only ULEV) Short to ground- 3.0 V	Valve-ON Engine speed- >80 rpm	0.5 Sec

		N75 , checking .				
P0246	Turbocharger/Supercharger Wastegate Solenoid "A" High	○ Check the Wastegate Bypass Regulator Valve N75. Refer to --> **Wastegate Bypass Regulator Valve N75 , checking** .	Only ULEV) Short to battery positive-2.2 4.0 A	Valve-OFF Engine speed- >80 rpm	0.5 Sec	
P0261	Cylinder 1 Injector Circuit Low	○ Check the fuel injectors N30. Refer to --> **Fuel Injectors N30, N31, N32, N33 , checking** . .	Short to ground- 3.0 V while injection valve is OFF	Engine speed-80 rpm	0.5 Sec	
P0262	Cylinder 1 Injector Circuit High	○ Check the fuel injectors N30. Refer to --> **Fuel Injectors N30, N31, N32, N33 , checking** .	Short to battery positive- 2.2 4.0 A while injection pump is ON	Engine speed-> 80 rpm	0.5 Sec	
P0264	Cylinder 2 Injector Circuit Low	○ Check the fuel injectors N31. Refer to --> **Fuel Injectors N30, N31, N32, N33 , checking** .	Short to ground 3.0 V while injection valve is OFF	Engine speed-80 rpm	0.5 Sec	
P0265	Cylinder 2 Injector Circuit High	○ Check the fuel injectors N31. Refer to --> **Fuel Injectors N30, N31, N32, N33 , checking** .	Short to battery positive- 2.2 4.0 Amps while injection pump is ON	Engine speed-80 rpm	0.5 Sec	
P0267	Cylinder 3 Injector Circuit Low	○ Check the fuel injectors N32. Refer to --> **Fuel Injectors N30, N31, N32, N33 , checking** .	Short to ground- 3.0 Volts while injection valve is OFF	Engine speed-80 rpm	0.5 Sec	
P0268	Cylinder 3 Injector Circuit High	○ Check the fuel injectors N32. Refer to --> **Fuel Injectors N30, N31, N32, N33 , checking** .	Short to battery positive- 2.2 4.0 A while injection pump is ON	Engine speed-> 80 rpm	0.5 Sec	
P0270	Cylinder 4 Injector Circuit Low	○ Check the fuel injectors N33. Refer to --> **Fuel Injectors N30, N31, N32, N33 , checking** .	Short to ground- 3.0 V while injection valve is OFF	Engine speed- 80 rpm	0.5 Sec	
P0271	Cylinder 4 Injector Circuit High	○ Check the fuel	Short to battery positive- 2.2	Engine speed- > 80 rpm	0.5 Sec	

		injectors N33. Refer to --> **Fuel Injectors N30, N31, N32, N33 , checking** .	4.0 A while injection pump is ON			
P0299	Turbocharger/Supercharger Underboost	○ Check the charge air system for proper seal. Refer to --> **21 - TURBOCHARGER, G-CHARGER**	(Only ULEV) Actual pressure lower than model pressure-200 mbar	Engine speed->2,400 3,000 Rpm Target charge->p amb (+)450 hPa	1 Sec	

Ignition system

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0300	Random/Multiple Cylinder Misfire Detected	○ Check the Spark plugs. ○ Check the intake system for leaks. ○ Check the fuel pressure. Refer to --> **Fuel Pump (FP) delivery quantity, checking** . ○ Check fuel injectors N30, N31, N32, N33, N83. ○ Check the Ignition Coils with Power Output	Multiple misfire, First 1,000 Revs- 1 time threshold Subsequent intervals- 4 times thresholds	Time for engine start- Idle 1,500 rpm(+) 1 camshaft revolution	---	• 2 DCY

		Stage N70, N127, N291, N292. Refer to --> **Ignition Coils with Power Output Stage N70, N127, N291, N292 , checking** .				
P0301	Cylinder 1 Misfire Detected	○ Check the Spark plugs. ○ Check the intake system for leaks. ○ Check the fuel pressure. Refer to --> **Fuel Pump (FP) delivery quantity, checking** . ○ Check fuel injectors N30, N31, N32, N33, N83. ○ Check the Ignition Coils with Power Output Stage N70, N127, N291, N292.	Emission threshold- (ULEV) >1.7% (LEV) 2.5% Catalyst damage percent misfire- (ULEV) >3 21% (LEV front) >5 27% (LEV Quattro) >6 39%	Engine speed range- Idle 6,560 Rpm Engine torque- >0 Nm Fuel cut off- Not active Shift command- No signal (ONLY NEW BEETLE AT) ECT- >20°(if ECTS (-) 7°)	- 1000 Rev. - 200 Rev.	- 2 DCY - immed

		Refer to --> **Ignition Coils with Power Output Stage N70, N127, N291, N292 , checking** .				
P0302	Cylinder 2 Misfire Detected	○ Check the Spark plugs. ○ Check the intake system for leaks. ○ Check the fuel pressure. Refer to --> **Fuel Pump (FP) delivery quantity, checking** . ○ Check fuel injectors N30, N31, N32, N33, N83. ○ Check the Ignition Coils with Power Output Stage N70, N127, N291, N292. Refer to --> **Ignition Coils with Power**	Emission threshold- (ULEV) >1.7% (LEV) 2.5% Catalyst damage percent misfire- (ULEV) >3 21% (LEV front) >5 27% (LEV Quattro) >6 39%	Engine speed range- Idle 6,560 Rpm Engine torque- >0 Nm Fuel cut off- Not active Shift command- No signal (ONLY NEW BEETLE AT) ECT- >20°(if ECTS (-) 7°)	• 1000 Rev. • 200 Rev.	• 2 DCY • immed

		Output Stage N70, N127, N291, N292 , checking .				
P0303	Cylinder 3 Misfire Detected	○ Check the Spark plugs. ○ Check the intake system for leaks. ○ Check the fuel pressure. Refer to --> **Fuel Pump (FP) delivery quantity, checking** . ○ Check fuel injectors N30, N31, N32, N33, N83. ○ Check the Ignition Coils with Power Output Stage N70, N127, N291, N292. Refer to --> **Ignition Coils with Power Output Stage N70, N127, N291,**	Emission threshold- (ULEV) >1.7% (LEV) 2.5% Catalyst damage percent misfire- (ULEV) >3 21% (LEV front) >5 27% (LEV Quattro) >6 39%	Engine speed range- Idle 6,560 Rpm Engine torque- >0 Nm Fuel cut off- Not active Shift command- No signal (ONLY NEW BEETLE AT) ECT- >20°(if ECTS (-) 7°)	• 1000 Rev. • 200 Rev.	• 2 DCY • immed

		N292 , checking .				
P0304	Cylinder 4 Misfire Detected	○ Check the Spark plugs. ○ Check the intake system for leaks. ○ Check the fuel pressure. Refer to --> **Fuel Pump (FP) delivery quantity, checking** . ○ Check fuel injectors N30, N31, N32, N33, N83. ○ Check the Ignition Coils with Power Output Stage N70, N127, N291, N292. Refer to --> **Ignition Coils with Power Output Stage N70, N127, N291, N292 , checking** .	Emission threshold- (ULEV) >1.7% (LEV) 2.5% Catalyst damage percent misfire- (ULEV) >3 21% (LEV front) >5 27% (LEV Quattro) >6 39%	Engine speed range- Idle 6,560 Rpm Engine torque- >0 Nm Fuel cut off- Not active Shift command- No signal (ONLY NEW BEETLE AT) ECT- >20°(if ECTS (-) 7°)	• 1000 Rev. • 200 Rev.	• 2 DCY • immed
P0321	Ignition/Distributor Engine Speed Input	○ Check the Engine	• Comparison of counted	---	0.1 Sec	• 2 DCY

	Circuit Range/Performance	Speed (RPM) Sensor G28. Refer to --> **Engine Speed (RPM) Sensor G28 , checking** .	teeth and number of teeth- (+_-) 1 tooth			
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	○ Check the Engine Speed (RPM) Sensor G28. Refer to --> **Engine Speed (RPM) Sensor G28 , checking** .	Comparison with phase sensor signal- No engine speed signal	---	0.1 Sec	• 2 DCY
P0324	Knock Control System Error	○ Check the Knock Sensors G61, G66. Refer to --> **Knock Sensor (KS) 1 G61/Knock Sensor (KS) 2 G66 , checking** .	Test impulse zero test- Procedure failed	ECT->40°C	150 Sec	• 2 DCY
P0327	Knock Sensor 1 Circuit Low	○ Check the Knock Sensor G61. Refer to --> **Knock Sensor (KS) 1 G61/Knock**	(ULEV) Lower threshold-0.25 2.4 V	Engine speed->2,200 Rpm ECT->40°C Engine load->25%	0.5 Sec	• 2 DCY

		Sensor (KS) 2 G66 , checking .				
P0328	Knock Sensor 1 Circuit High	○ Check the Knock Sensor G61. Refer to --> **Knock Sensor (KS) 1 G61/Knock Sensor (KS) 2 G66 , checking** .	(LEV)Upper threshold- 4.6 58.0 V	Engine speed->2,200 Rpm ECT->40°C Engine load->25%	0.5 Sec	• 2 DCY
P0332	Knock Sensor 2 Circuit Low	○ Check the Knock Sensor G66. Refer to --> **Knock Sensor (KS) 1 G61/Knock Sensor (KS) 2 G66 , checking** .	ULEV) Lower threshold-0.25 2.4 V	Engine speed->2,200 Rpm ECT->40°C Engine load->25%	0.5 Sec	• 2 DCY
P0333	Knock Sensor 2 Circuit High	○ Check the Knock Sensor G66. Refer to --> **Knock Sensor (KS) 1 G61/Knock Sensor (KS) 2 G66 , checking** .	(LEV) Upper threshold-4.6 58.0 V	Engine speed->2,200 Rpm ECT->40°C Engine load->25%	0.5 Sec	• Multiple • 2 DCY
P0340	Camshaft Position Sensor "A" Circuit	○ Check the Camshaft Position	ULEV) Comparison to engine speed	Engine speed-600 1,600 Rpm	2 Sec 2 Sec	• 2 DCY

		(CMP) Sensor G40. Refer to --> **Camshaft Position (CMP) Sensor G40 , checking** .	sensor (adaptation)- Adaptation values at limit >16 KW (LEV) Comparison to engine speed sensor (adaptation)- Adaptation values at limit >16 KW	ECT >50.25°C Engine speed-600 1,600 Rpm ECT >50.25°C		
P0341	Camshaft Position Sensor "A" Circuit Range/Performance	○ Check the Camshaft Position (CMP) Sensor G40. Refer to --> **Camshaft Position (CMP) Sensor G40 , checking** .	Comparison to engine speed sensor- Signal high during 12 crankshaft rotations	---	0.5 Sec	• 2 DCY
P0342	Camshaft Position Sensor " A" Circuit Low	○ Check the Camshaft Position (CMP) Sensor G40. Refer to --> **Camshaft Position (CMP) Sensor G40 , checking** .	Comparison to engine speed sensor- Signal high during 12 crankshaft rotations	--	0.5 Sec	• 2 DCY
P0343	Camshaft Position Sensor " A" Circuit High	○ Check the Camshaft Position (CMP) Sensor G40. Refer to --> **Camshaft Position**	Comparison to engine speed sensor- Signal high during 12 crankshaft rotations	---	0.5 Sec	• 2 DCY

		(CMP) Sensor G40 , checking .				
P0351	Ignition Coil "A" Primary/Secondary Circuit	○ Check the Ignition Coils with Power Output Stage N70. Refer to --> **Ignition Coils with Power Output Stage N70, N127, N291, N292 , checking** .	Short to battery positive->5.2 6.0 V Short to ground-0.5 1.0 V Open circuit- 5.0 8.8 mA	Engine speed->80 rpm	0.5 Sec	• 2 DCY
P0352	Ignition Coil "B " Primary/Secondary Circuit	○ Check the Ignition Coils with Power Output Stage N127. Refer to --> **Ignition Coils with Power Output Stage N70, N127, N291, N292 , checking** .	Short to battery positive->5.2 6.0 V Short to ground-0.5 1.0 V Open circuit-5.0 8.8 mA	Engine speed->80 rpm	0.5 Sec	• 2 DCY
P0353	Ignition Coil "C" Primary/Secondary Circuit	○ Check the Ignition Coils with Power Output Stage N291. Refer to --> **Ignition**	Short to battery positive->5.2 6.0 V Short to ground-0.5 1.0 V Open circuit-5.0 8.8 mAmps	Engine speed->80 rpm	0.5 Sec	• 2 DCY

		Coils with Power Output Stage N70, N127, N291, N292 , checking .				
P0354	Ignition Coil "D" Primary/Secondary Circuit	○ Check the Ignition Coils with Power Output Stage N292. Refer to --> **Ignition Coils with Power Output Stage N70, N127, N291, N292 , checking** .	Short to battery positive->5.2 6.0 V Short to ground-0.5 1.0 V Open circuit-5.0 8.8 mA	Engine speed->80 rpm	0.5 Sec	• 2 DCY

Additional exhaust regulation

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0411	Secondary Air Injection System Incorrect Flow Detected	○ Check the Secondary Air System hose routing. Refer to --> **26 - EXHAUST SYSTEM, EMISSION CONTROLS** .	System too RICH-18% (LEV) Flow check during normal SA injection system too RICH (check after engine start)-45% Flow check during SA injection enabled by monitor if 1st	Catalyst temperature-700°C Engine speed-Idle Mass air flow-6 32 kg/h Vehicle speed-Time after engine start->124 sec ECTS- 5 40° C Altitude-2,500 m Air mass flow-80 kg/h (make	2 - 10 Sec 30 Sec	2 DCY

			chance is not completed (system too RICH)-45%	checks after engine start up) ECT->40°C Time after engine starts->115 sec Catalyst temperature-700°C Altitude-2,500 m air mass flow-5 40 kg/h Vehicle speed-3 Mph number of checks-5		
P0413	Secondary Air Injection System Switching Valve (A) Circuit Open	○ Check the Secondary Air Injection (AIR) Solenoid Valve N112. Refer to --> **Secondary Air Injection (AIR) Solenoid Valve -N112- , checking** .	Open circuit-9.5 11.25 Volts	Air valve, OFF Engine speed >80 rpm	0.5 Sec	2 DCY
P0414	Secondary Air Injection System Switching Valve (A) Circuit Shorted	○ Check the Secondary Air Injection (AIR) Solenoid Valve N112. Refer to --> **Secondary Air Injection (AIR) Solenoid Valve -N112- , checking** .	Short to Battery + 2.2-4.2 V Short to Ground, 6 V	Air valve, On Engine speed, >80 rpm Air valve, OFF Engine speed >80 rpm	0.5 Sec	2 DCY
P0418	Secondary Air Injection System	○ Check the Secondary Air Injection	Short to battery positive-0.6	Pump relay-ON Engine speed->80	0.5 Sec	2 DCY

	Control A Circuit	(AIR) Solenoid Valve N112. Refer to --> **Secondary Air Injection (AIR) Solenoid Valve -N112- , checking** .	1.2 A Short to ground-3.0 V Open circuit-4.5 5.5 V	Rpm Pump relay-OFF Engine speed->80 Rpm Pump relay-OFF Engine speed->80 rpm		
P0420	Catalyst System Efficiency Below Threshold	○ Check the Heated Oxygen Sensor (HO2S) G39. Refer to --> **Heated Oxygen Sensor (HO2S) G39 and oxygen sensor regulation before catalytic converter, checking** . ○ Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130. Refer to --> **Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and oxygen sensor regulation behind catalytic**	ULEV) AR->2 (LEV) AR-Front: >0.25 Quattro: 0.26	Time after start-255 sec Engine start temperature->(-) 10°C Delta airflow-20 kg/k/sec EVAP purge flow-25% Mass air flow @-24 75 kg/h Catalyst temperature-560 710°C Mass air flow @-90 120 kg/h Catalyst temperature-695 800°C Front:Catalyst temperature-460 600°C Engine speed-1,520 2,800 Rpm Engine load-10 35% Quattro: Catalyst temperature-39 560°C Engine speed-1,800 3,200 Rpm Engine load-13 43%	70 Seconds Front: 90 Sec	• Once/DCY • 2 DCY

		converter, checking ○ Check the Three Way Catalytic Converter (TWC). Refer to --> **Three Way Catalytic Converter (TWC), checking** .				
P0441	Evaporative Emission System Incorrect Purge Flow	○ Check the Evaporative Emission (EVAP) Canister System for proper seal. Refer to --> **Evaporative Emission (EVAP) canister system, checking for proper seal** . ○ Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80. Refer to --> **Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 , checking (AMB Engine Code)** .	Reaction of idle controller or lambda controller deviation less than 7% lambda controller and 30% idle controller	Engine speed-Idle Speed deviation-(+/-)80 Rpm Altitude-2,500 m Time after start-(ULEV) > 450 sec (LEV) > 600 sec ECT or substitute temperature-> 60 or 70°C	25 Seconds	• 2 DCY

		○ Check the Leak Detection Pump (LDP) V144. Refer to --> **Leak Detection Pump (LDP) V144 , checking (AMB Engine Code)** .				
P0442	Evaporative Emission System Leak Detected (Small Leak)	○ Check the Evaporative Emission (EVAP) Canister System for proper seal. Refer to --> **Evaporative Emission (EVAP) canister system, checking for proper seal** . ○ Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80. Refer to --> **Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 , checking (AMB Engine Code)** .	Pressure drop within predetermined times-1.85 2.05 sec (depending on altitude and intake air temperature) Pressure drop within predetermined times-2.3 2.7 sec (depending on altitude and intake air temperature)	Purge valve CLOSED LDP-Activated Altitude-2.500 m Intake air temperature->5°C Ambient pressure->6 hPa Reduction of intake air start: no deep down hill driving-vehicle speed at low load (2%) Time after engine start-255 sec Intake manifold low pressure>150 hPa Engine temperature-5 - 115°C Restart ECT difference->50°C Vehicle speed->6 mph Purge valve	Max 140 seconds, once every driving cycle	- 2 DCY

		○ Check the Leak Detection Pump (LDP) V144. Refer to --> **Leak Detection Pump (LDP) V144 , checking (AMB Engine Code)** .		CLOSED LDP-Activated Altitude-2.500 m Ambient pressure-3 hPa Intake manifold low pressure-> 130 hPa Engine temperature-(-)9.75 105°C Restart temperature difference-5° C Reduction of intake air-5k Time after restart-230 2,000 sec		
P0444	Evaporative Emission System Purge Control Valve Circuit Open	○ Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80. Refer to --> **Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 , checking (AMB Engine Code)** .	Open circuit-Signal voltage >4.5 - 5.5 V	• EVAP purge valve, off • Engine speed, > 80 RPM	0.5 Seconds	• 2 DCY
P0445	Evaporative Emission System Purge Control Valve Circuit Shorted	○ Check the Evaporative Emission (EVAP) Canister Purge Regulator	Short to Battery + 2.2 - 4 V Short to Ground, 3 V	EVAP. Purge valve-On Engine speed-80 Rpm EVAP. Purge valve-OFF Engine speed-	0.5 Seconds	2 DCY

		Valve N80. Refer to --> **Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 , checking (AMB Engine Code)** .		80 Rpm		
P0449	Evaporative Emission System Vent Valve/Solenoid Circuit	○ Check the Evaporative Emission (EVAP) Canister System for proper seal. Refer to --> **Evaporative Emission (EVAP) canister system, checking for proper seal** . ○ Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80. Refer to --> **Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 , checking (AMB Engine Code)** . ○ Check the	(Only LEV Audi TT) Short to battery positive- 2.7 5.5 A Short to ground- >3.0 V Open circuit-4.5 5.5 V	Valve-ON Engine speed- >80 rpm Valve-OFF Engine speed- >80 rpm Valve-OFF Engine speed- >80 rpm	0.5 Sec 0.5 Sec 0.5 Sec	2 DCY

		Leak Detection Pump (LDP) V144. Refer to --> **Leak Detection Pump (LDP) V144 , checking (AMB Engine Code)** .				
P0455	Evaporative Emission System Leak Detected (large leak)	○ Check the Evaporative Emission (EVAP) Canister System for proper seal. Refer to --> **Evaporative Emission (EVAP) canister system, checking for proper seal** . ○ Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80. Refer to --> **Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 , checking (AMB Engine Code)** . ○ Check the Leak	Pressure drop within predetermined times-0.95 Seconds Pressure drop within predetermined times-2.3 2.7 seconds (depending on altitude and intake air temperature)	Purge valve CLOSED LDP-Activated Altitude-2.500 m Intake air temperature-> 5°C Ambient pressure-> 6hPa Reduction of intake air start: no deep down hill driving-vehicle speed at low load (2%) Time after engine start-255 sec Intake manifold low pressure> 150 hPa Engine temperature-5 - 115°C Restart ECT difference-> 50°C Vehicle speed-> 6 Mph Purge valve CLOSED LDP-Activated	Max 140 Sec once every driving cycle	- 2 DCY

		Detection Pump (LDP) V144. Refer to --> **Leak Detection Pump (LDP) V144 , checking (AMB Engine Code)** .		Altitude- 2.500 m Ambient pressure- 3 hPa Intake manifold low pressure-> 130 hPa Engine temperature- (-)9.75 105°C Restart temperature difference- 5° C Reduction of intake air- 5k Time after restart-230 2,000 sec		
P0456	Evaporative Emission System Leak Detected (very small leak)	○ Check the Evaporative Emission (EVAP) Canister System for proper seal. Refer to --> **Evaporative Emission (EVAP) canister system, checking for proper seal** . ○ Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80. Refer to --> **Evaporative Emission (EVAP) Canister Purge**	Pressure drop within predetermined times-2.05 7 sec Pressure drop within predetermined times-2.3 2.7 sec (depending on altitude and intake air temperature)	Purge valve CLOSED LDP- Activated Altitude- 2.500 m Intake air temperature-> 5°C Ambient pressure-> 6hPa Reduction of intake air start: no deep down hill driving- vehicle speed at low load (2%) Time after engine start-255 sec Intake manifold low pressure> 150 hPa Engine temperature-5 - 115°C Restart ECT	Max 140 Sec once every driving cycle	• 2 DCY

		Regulator Valve N80 , checking (AMB Engine Code) . ○ Check the Leak Detection Pump (LDP) V144. Refer to --> **Leak Detection Pump (LDP) V144 , checking (AMB Engine Code)** .		difference-> 50°C Vehicle speed-> 6 Mph Purge valve CLOSED LDP- Activated Altitude- 2.500 m Ambient pressure- 3 hPa Intake manifold low pressure-> 130 hPa Engine temperature- (-)9.75 105°C Restart temperature difference- 5° C Reduction of intake air- 5k Time after restart-230 2,000 sec		

Speed and idle control

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0501	Vehicle Speed Sensor "A" Range/Performance	○ Check vehicle speed signal. Refer to.	Vehicle speed signal- 2 mph	• Fuel cut off, active • Engine speed, 1520- 4520 RPM	4 Sec	• 2 DCY
P0506	Idle Air Control System RPM Lower Than Expected	○ Check the Throttle Valve Control	Idle speed deviation (idle speed too high) and	Engine speed, idle Engine load, 37%	4 Sec	• 2 DCY

		Module J338. Refer to --> **Throttle Valve Control Module J338 , checking** .	idle controller at max. threshold - 100 RPM	ULEV::ECT, > 48°C LEV:ECT, > 60°C Purge valve, off Altitude, 2500 m Accelerator Position, 0% Vehicle speed, 0 Mph LEV: Air intake > 0°C		
P0507	Idle Air Control System RPM Higher Than Expected	○ Check the Throttle Valve Control Module J338. Refer to --> **Throttle Valve Control Module J338 , checking** .	Idle speed deviation (idle speed too high) and idle controller at min. threshold > 200 Rpm	Engine speed, idle Fuel cut off, not active ULEV:ECT, > 48°C LEV:ECT, > 60°C Purge valve, off Altitude, 2500 m Accelerator Position, 0% Vehicle speed, 0 Mph LEV: Air intake > 0°C	4 Sec	• 2 DCY

Control module and output signals

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0600	Serial Communication Link	○ Replace the Motronic Engine Control Module (ECM) J220. Refer to --> **Motronic Engine Control Module (ECM) J220 , replacing** .	Short to battery positive Short to ground Core connection ECM receiving no signal from	---	0.5 Sec 0.5 Sec	2 DCY

			CAN bus			
P0601	Internal Control Module Memory Check Sum Error	○ Replace the Motronic Engine Control Module (ECM) J220. Refer to --> **Motronic Engine Control Module (ECM) J220 , replacing** .	Calculate check sum		0.5 Sec	• 2 DCY
P0602	Control Module Programming Error	○ Replace the Motronic Engine Control Module (ECM) J220. Refer to --> **Motronic Engine Control Module (ECM) J220 , replacing** .	Message arriving from automatic transmission while ECU is calibrated for manual transmission-Message from automatic transmission	---	0.5 Sec	2 DCY
P0603	Internal Control Module Memory Check Sum Error	○ Replace the Motronic Engine Control Module (ECM) J220. Refer to --> **Motronic Engine Control Module (ECM) J220 , replacing** . ○ Replace the Transmission Control Module (TCM) J217. Refer to --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD.	Write and read back value is not correct	---	200 mS	yes; immediate

		AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or --> - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				
P0604	Internal Control Module Random Access Memory (RAM) Error	○ Replace the Motronic Engine Control Module (ECM) J220. Refer to --> **Motronic Engine Control Module (ECM) J220 , replacing** .	Write ability check		0.5 Sec	- 2 DCY
P0605	Internal Control Module Read Only Memory (ROM) Error	○ Replace the Motronic Engine Control Module (ECM) J220. Refer to --> **Motronic Engine Control Module (ECM) J220 , replacing** .	Wrong check sum		0.5 Sec	- 2 DCY

P0606	Internal Control Module Memory Check Sum Error	○ Replace the Motronic Engine Control Module (ECM) J220. Refer to --> **Motronic Engine Control Module (ECM) J220 , replacing** .	Short to Battery +, > 4.88 V Short to Ground, 0.14 V	---	2 Sec	• 2 DCY
P0638	Throttle Actuator Control Range/Performance	○ Check the Throttle Valve Control Module J338. Refer to --> **Throttle Valve Control Module J338 , checking** .	OPEN to > ref. Point (+) 12%- t> 0.14 seconds Then CLOSED to ref. point (+) 3% t > 0.56 Sec Closed to 1% t > 0.3 Sec then OPEN to ref. (-) 1.5% t > 0.56 Sec Voltage ranges- sensor1: 0.21 - 0.87 V sensor 2: 4.14 - 4.84 V	Ignition-ON Engine speed-0 Rpm Intake air temperature-> 5°C Vehicle speed-0 Mph ECT-> 5°C Ignition-ON Engine speed-0 Rpm Intake air temperature-> 5°C Vehicle speed-0 Mph ECT-> 5°C Ignition-ON Engine speed-0 Rpm Intake air temperature-> 5°C Vehicle speed-0 Mph ECT-> 5°C	5 Sec	• 2 DCY
P0685	ECM/PCM Power Relay Control CircuitOpen	○ Check the Motronic Engine Control Module (ECM) Power Supply Relay J271. Refer to --> **Motronic Engine Control Module (ECM) Power Supply Relay**	Open circuit- Control voltage 0.61 Volts	Sense circuit voltage-3.0 Volts	0.5 Sec	• 2 DCY

		J271 , checking .				
P0686	ECM/PCM Power Relay Control Circuit Low	○ Check the Motronic Engine Control Module (ECM) Power Supply Relay J271. Refer to --> **Motronic Engine Control Module (ECM) Power Supply Relay J271 , checking** .	Short to ground-Control voltage 0.51 Volts	Sense circuit voltage- > 5.5 V	0.5 Sec	• 2 DCY
P0687	ECM/PCM Power Relay Control Circuit High	○ Check the Motronic Engine Control Module (ECM) Power Supply Relay J271. Refer to --> **Motronic Engine Control Module (ECM) Power Supply Relay J271 , checking** .	Short to battery positive-Control voltage >4.0 Volts	Sense circuit voltage- 3.0 V	0.5 Sec	• 2 DCY
P0688	ECM/PCM Power Relay Sense Circuit Open	○ Check the Motronic Engine Control Module (ECM) Power Supply Relay J271. Refer to --> **Motronic Engine Control Module (ECM) Power Supply Relay J271 , checking** .	Voltage too low-3.0 Volts	• Main relay-On	2 Sec	• 2 DCY

Transmission 01V

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length
P0706	Transmission Range Sensor Circuit. Refer to-F125 Range/Performance	○ Check the Multi-Function Transmission Range (TR) Switch F125. Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION	Illegal 4-bit position code not P or N while cranking at engine start up.	Engine speed between 100-448 RPM	2500 mS

		01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .			
P0716	Input Turbine/Speed Sensor (A) Circuit Range/Performance	○ Check the Transmission Input Speed (RPM) Sensor G182. Refer to the -->	• Turbine speed max, > 8000 RPM • Turbine speed	None or engine speed, > 608 RPM	200 mS

		• **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J -	min, 160 RPM		

		INTERNAL COMPONENTS, SERVICING .			
P0721	Output Speed Sensor Circuit Range/Performance	○ Check the Transmission Vehicle Speed Sensor (VSS) G38. Refer to the -> - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - **38 -**	- Output speed max, > 6912 RPM - Output speed min, 160 RPM	None or engine speed >40 km/h	1000 mS

		AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .			
P0730	Incorrect Gear Ratio	○ Check the Transmission Input Speed (RPM) Sensor G182 and Transmission Vehicle Speed Sensor (VSS) G38. Refer to --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 -**	• Turbine speed > threshold (stall) speed, > 1200 rpm • Synchronization not achieved during shift. • Calculated ratio outside allowable range	• Output speed, 250 RPM in D, 4, 3, 2 position for a time of >500 mS • Output speed, >500 RPM • Output speed, >256 RPM • Input speed, >416 RPM	• 200 mS • 3 event • 2 sympto (P0730 logged)

		AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .			
P0731	Gear 1 Incorrect Ratio	• Check ATF level • Check pressure regulator valves • Check Solenoid Valve 1 -N88- Mechanical malfunction in transmission ○ Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 -**	Differential speed, 416-320 RPM	---	2.49 Seconds

		AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .			
P0732	Gear 2 Incorrect Ratio	• Check ATF level • Check pressure regulator valves • Check Solenoid Valve 2 -N89-	Differential speed, 416-320 RPM	---	2.49 Seconds

		Mechanical malfunction in transmission ○ Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for			

		CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .			
P0733	Gear 3 Incorrect Ratio	• Check ATF level • Check pressure regulator valves • Check Solenoid Valve 3 -N90- Mechanical malfunction in transmission ○ Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the -->	Differential speed, 416-320 RPM	---	2.49 Seconds

		• **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .			
P0734	Gear 4 Incorrect Ratio	• Check ATF level • Check pressure regulator valves • Check Solenoid Valve 4 -N91- Mechanical malfunction in transmission ○ Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V	Differential speed, 416-320 RPM	---	2.49 Seconds

		- **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .			
P0735	Gear 5 Incorrect Ratio	- Check ATF level - Check pressure regulator valves - Check Solenoid Valve 5 -	Differential speed, 416-320 RPM	---	2.49 Seconds

		N92- Mechanical malfunction in transmission ○ Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS,**			

		HYDRAULIC CONTROLS for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .			
P0741	Torque Converter Clutch Circuit Performance or Stuck Off.	○ Check the Torque converter clutch. Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY	• Comparison with stored values, Slip differences > 448 rpm • Slip threshold, 80 RPM	• Engine torque, 140 Nm • Clutch pressure, > 5.24 bar	• 1 Seco • 1000 m

		VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .			
P0751	Shift Solenoid A Performance or Stuck Off.	○ Check Solenoid Valve 1 -N88-. Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the -->	Solenoid on, measured V too high,	---	50 mS

		• **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .			
P0752	Shift Solenoid A Stuck On	○ Check Solenoid Valve 1 -N88-. Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND	Solenoid on, measured V too low, 0.2	---	50 mS

		ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .			
P0753	Shift Solenoid A Electrical	○ Check Solenoid Valve 1 -N88-. Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION**	Comparison of stored value with active level, switch off and U- 2V or switch on and U >6 V	Battery V U > 9 V	• 0.24 Second • 0.02 Second

		- GEARS, HYDRAULIC CONTROLS for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .			
P0756	Shift Solenoid B Performance or Stuck Off.	○ Check Solenoid Valve 2 -N89-. Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD.	Solenoid on, measured V too low, 0.2	---	70 mS

		AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .			
P0757	Shift Solenoid B Stuck On	○ Check Solenoid Valve 2 -N89-. Refer to the -->	Solenoid on, measured V too low, 0.2	---	70 mS

		- **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J -			

		INTERNAL COMPONENTS, SERVICING .			
P0758	Shift Solenoid B Electrical	○ Check Solenoid Valve 2 -N89-. Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION**	Comparison of stored value with active level, switch off U-2V or switch on and U >6 V	Battery V U > 9 V	• 0.24 Second • 0.02 Second

		- GEARS, HYDRAULIC CONTROLS for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .			
P0761	Shift Solenoid C Performance or Stuck Off.	○ Check Solenoid Valve 3 -N90-. Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY	Solenoid on, measured V too low, 0.2	---	70 mS

		VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .			
P0762	Shift Solenoid C Stuck On	○ Check Solenoid Valve 3 - N90-. Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the -->	Solenoid on, measured V too low, 0.2	---	70 mS

		• **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .			
P0763	Shift Solenoid C Electrical	○ Check Solenoid Valve 3 -N90-. Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND	Comparison of stored value with active level, switch off U-2V or switch on and U >6 V	Battery V U > 9 V	• 0.24 Second • 0.02 Second

		ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .			

SAE P1xxx-DTCs

Fuel and Air ratios, control module

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P1176	Bank 1, Lambda correction downstream of catalyst control limit reached	○ Check the Oxygen Sensor (O2S) Behind Three Way	System too LEAN/RICH delta lambda signal->2%	Lamda controller-CLOSED loop Rear O2 sensor heater and electrical check-No	100 Sec	2 DCY

		Catalytic Converter (TWC) G130. Refer to --> **Oxygen Sensor (O2S) Heater Z19 before catalytic converter, checking** .		DTC Catalyst temperature-> 470°C Engine speed-1,500 4,000 Rpm Engine load-24 65%		

Transmission 01V

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequ of che MIL Illum
P1560	Engine Overspeed Condition	○ Check the Transmission Input Speed (RPM) Sensor G182 and Transmission Vehicle Speed Sensor (VSS) G38. Refer to --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION	Engine speed > threshold, > 7400 rpm	In D, 4, 3, 2 position	100 mS	Yes, 2 DCY

		01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				
P1745	Voltage supply for solenoid valves Short circuit to B+	○ Check Transmission Control Module (TCM) J217. Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 -**	Switch off, V too high	> 0.8 * U Batt	30 mS	Yes, 2 DCY

		AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				
P1747	Voltage supply for solenoid valves Open circuit/short circuit to Ground (GND)	○ Check Transmission Control Module (TCM) J217. Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS,**	Switch on, V too low	2.5 V	30 mS	Yes, 2 DCY

		HYDRAULIC CONTROLS for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				

	Internal Control Module Memory Check Sum Error	○ Check Transmission Control Module (TCM) J217. Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY	TCM internal hardware watchdog detects fault	---	100 mS	Yes, 2 DCY

		VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				
P1750	System Voltage, Low Voltage	○ Check Transmission Control Module (TCM) J217 voltage supply. Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION	• Voltage, U 9 V • Ignition range out of range, 7.0 V U 9.0 V	• Engine speed, > 1600 rpm	• 0.14 Seconds • 2500 mS	Yes, 2 DCY

		(CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				
P1751	System Voltage High Voltage	○ Check Transmission Control Module (TCM) J217 voltage supply. Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the -->	Ignition supply out of allowable range, U > 16 V and U 7 V	Engine speed, >1400 rpm	300 mS	Yes, 2 DCY

		- **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				
P1814	Pressure control valve -1- for auto. transmission -N215- Open circuit/short circuit to Ground (GND)	○ Refer to the --> - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL	PWM should toggle, but held to 0-100%	Ignition voltage, >9.0 V or current and voltage, >500 mA, 7V	70 mS	Yes, 2 DCY

		DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				
P1815	Pressure control valve -1- for auto. transmission -N215- Short circuit to B+	○ Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC**	PWM should toggle, but held to 0-100%	Ignition voltage, >9.0 V or current and voltage, >500 mA, 7V	70 mS	Yes, 2 DCY

		CONTROLS for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				
P1819	Pressure control valve -2- for auto. transmission -N216- Open circuit/short circuit to Ground (GND)	○ Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V	PWM should toggle, but held to 0-100%	Ignition voltage, >9.0 V or current and voltage, >500 mA, 7V	50 mS	Yes, 2 DCY

		• **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				
P1820	Pressure control valve -2- for auto. transmission -N216- Short circuit to B+	○ Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS,**	PWM should toggle, but held to 0-100%	Ignition voltage, >9.0 V or current and voltage, >500 mA, 7V	50 mS	Yes, 2 DCY

		HYDRAULIC CONTROLS for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				

	Pressure control valve -3- for auto. transmission -N217- Open circuit/short circuit to Ground (GND)	○ Refer to the --> - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION	PWM should toggle, but held to 0-100%	Ignition voltage, >9.0 V or current and voltage, >500 mA, 7V	50 mS	Yes, 2 DCY

		(CVT) 01J - INTERNAL COMPONENTS, SERVICING .				
P1825	Pressure control valve -3- for auto. transmission -N217- Short circuit to B+	○ Refer to the --> - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - **38 - AUTOMATIC TRANSMISSION**	PWM should toggle, but held to 0-100%	Ignition voltage, >9.0 V or current and voltage, >500 mA, 7V	50 mS	Yes, 2 DCY

		- GEARS, HYDRAULIC CONTROLS for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				
P1829	Pressure control valve -4- for auto. transmission -N218- Open circuit/short circuit to Ground (GND)	○ Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE	PWM should toggle, but held to 100%	Ignition voltage, >9.0 V or current and voltage, >500 mA, 7V	• 70 mS • 500 mS	Yes, 2 DCY

		TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				
P1830	Pressure control valve -4- for auto. transmission -N218- Short circuit to B+	○ Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC**	PWM should toggle, but held to 0%	Ignition voltage, >9.0 V or current and voltage, >500 mA, 7V	• 70 mS • 500 mS	Yes, 2 DCY

		TRANSMISSION - GEARS, HYDRAULIC CONTROLS for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				
P1841	Engine control module/Transmission Control Module (TCM) Versions not compatible	○ Replace the Transmission Control Module (TCM) J217. Refer to the --> - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V - **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL	---	---	0 mS	Yes, 2 DCY

		DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				
P1850	Data-bus-drivetrain missing message from engine control module	○ Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC**	No network token for 850 mS	---	1000 mS	Yes, 2 DCY

		CONTROLS for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				
P1854	Data-Bus-driving gear Hardware faulty	○ Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V	No CAN bus activity for 30 mS	---	1000 mS	Yes, 2 DCY

		• **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				
P1855	Data-Bus-driving gear Software version monitoring	○ Refer to the --> • **38 - AUTOMATIC TRANSMISSION - GEARS,**	CAN level not correct	---	100 mS	Yes, 2 DCY

		HYDRAULIC CONTROLS for 5 SPD. AUTOMATIC TRANSMISSION 01V • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for 5 SPD. AUTOMATIC TRANSMISSION 01V FRONT AND ALL WHEEL DRIVE - INTERNAL COMPONENTS, SERVICING or the --> • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J • **38 - AUTOMATIC TRANSMISSION - GEARS, HYDRAULIC CONTROLS** for CONTINUOUSLY VARIABLE TRANSMISSION (CVT) 01J - INTERNAL COMPONENTS, SERVICING .				

	Throttle Position (TP) Sensor -G79- Malfunction indication from Engine Control Module (ECM)	○ Check the Throttle Position (TP) Sensor G79. Refer to --> **Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking (Engine Code AMB)** .	Fault flag is transmitted, fault flag set	---	400 mS	Yes, 2 DCY

SAE P2xxx-DTCs

Fuel and air ratio

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2101	Evaporative Emission System Leak Detection Pump Control Circuit Low	○ Check the Leak Detection Pump (LDP) V144. Refer to --> **Leak Detection Pump (LDP) V144 , checking (AMB Engine Code)** .	Max. current- > 80% Throttle valve angle deviation- Max=4 50%	ECM power stage-Failure ---	0.5 Sec 0.5 Sec	• 2 DCY
P2122	Throttle/Pedal Position Sensor/Switch C Circuit Low Input	○ Check the Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185. Refer to --> **Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking (Engine Code AMB)** .	(ULEV) Lower threshold- 0.63 V (LEV) Lower threshold- 0.63 V	Sensor voltage 2- > 1.11 V Sensor voltage 2- > 1.15 V	0.5 Sec 0.5 Sec	• 2 DCY
P2123	Throttle/Pedal Position Sensor/Switch C Circuit High Input	○ Check the Throttle Position (TP) Sensor G79/Accelerator	Upper threshold- > 4.82 Volts		0.5 Sec	• 2 DCY

		Pedal Position Sensor 2 G185. Refer to --> **Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking (Engine Code AMB)** .				
P2127	Accelerator pedal position sender 2 - G185 signal too low	○ Check the Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185. Refer to --> **Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking (Engine Code AMB)** .	(ULEV) Lower threshold- 0.43 V (LEV) Lower threshold- 0.33 V	Sensor voltage 2- > 1.11 V Sensor voltage 2- > 1.15 V	0.5 Sec 0.5 Sec	• 2 DCY • 2 DCY
P2128	Accelerator pedal position sender 2 - G185 signal too high	○ Check the Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185. Refer to --> **Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking (Engine Code AMB)** .	Upper threshold- > 4.94		0.5 Sec	• 2 DCY
P2138	Throttle/Pedal Position	○ Check the Throttle Position	(ULEV) Comparison	Sensor voltage1,2-	0.5 Sec 0.5 Second	• 2 DCY

	Sensor/Switch C Circuit Range/Performance	(TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185. Refer to --> **Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking (Engine Code AMB)** .	signal, sensor 1 vs- sensor 2 difference- > 0.21 - 1.11 V (LEV) Comparison signal, sensor 1 vs- sensor 2 difference- > 0.21 - 1.23 V	> 0.84V Sensor voltage 1, 2- >0.86V		• 2 DCY
P2181	Malfunction in cooling system	○ Check the Engine Coolant Temperature (ECT) Sensor G62. Refer to --> **Engine Coolant Temperature (ECT) Sensor G2 , checking**	Engine coolant temperature- 80.25°C Sufficient mass air- 8 18 kg Engine coolant temperature- > 10 K Sufficient mass air- 4 11.5 kg	Engine start temperature- 5 30°C Average air mass range (depending on average speed)- > 18 60 kg/h Average vehicle speed- 9 80 Mph Total time fuel cut off- 100 sec Engine start temperature- 5 30°C Average air mass range (depending on average speed)- > 24 62 kg/h Average vehicle speed- 22 74 Mph Total time fuel cut off- 100 seconds Delta ambient	Once per driving cycle Once per driving cycle	2 DCY

				pressure per monitor- 15hPa		

Additional emission regulations

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	○ Check the Leak Detection Pump (LDP) V144. Refer to --> **Leak Detection Pump (LDP) V144 , checking (AMB Engine Code)** .	Open circuit- 2.25 V	LPD- OFF Engine speed- > 80 Rpm	0.2 Sec	• 2 DCY
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	○ Check the Leak Detection Pump (LDP) V144. Refer to --> **Leak Detection Pump (LDP) V144 , checking (AMB Engine Code)** .	Short to ground- 2.25-3.01 V	LPD- OFF Engine speed- > 80 Rpm	0.2 Sec	• 2 DCY
P2402	Evaporative Emission System Leak Detection Pump Control	○ Check the Leak Detection Pump	Short to battery positive- >3.01 Volts	LPD- ON Engine speed- > 80 Rpm	0.2 Sec	• 2 DCY

	Circuit High	(LDP) V144. Refer to --> **Leak Detection Pump (LDP) V144 , checking (AMB Engine Code)** .				
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	○ Check the Leak Detection Pump (LDP) V144. Refer to --> **Leak Detection Pump (LDP) V144 , checking (AMB Engine Code)** .	Contact unable to CLOSE-Signal always low	LDP-OFF Purge valve check-Completed	0.2 Sec	• 2 DCY
P2404	Evaporative Emission System Leak Detection Pump Sense Range/Performance	○ Check the Leak Detection Pump (LDP) V144. Refer to --> **Leak Detection Pump (LDP) V144 , checking (AMB Engine Code)** .	Contact unable to OPEN-Signal always high	LDP-ON Purge valve check-Completed	0.2 Sec	• 2 DCY
P2422	Evaporative Emission System	○ Check the Leak	(Only LEV Audi TT) 2nd	Purge valve OPEN LDP-	240 Sec	2 DCY

	Vent Valve Stuck Closed	Detection Pump (LDP) V144. Refer to --> **Leak Detection Pump (LDP) V144 , checking (AMB Engine Code)** .	leak check while valve is open-2.3 2.7 seconds	Activated Altitude- 2.500 m Intake air temperature- > 5°C Ambient pressure- > 6 hPa Reduction of intake air start: no deep downhill driving- vehicle speed at low load (2%) Time after engine start- 255 sec Intake manifold low pressure > 150 hPa Engine temperature- 5 - 115°C Restart ECT difference- > 50°C Vehicle speed- > 6 Mph		

SAE P3xxx-DTCs

Fuel and air mixture, additional emissions regulations

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P3081	Engine Temperature Too Low	○ Check the Engine Coolant Temperature (ECT) Sensor G62. Refer to --> **Engine**	Measured temperature lower than model temperature- >10 K Measured	---	Once/DCY Once per DCY	• 2 DCY 2 DCY

		Coolant Temperature (ECT) Sensor G2 , checking .	temperature-65°C Measured temperature lower than model temperature->10 K Measured temperature-50°C			

20 - FUEL SUPPLY

FUEL SUPPLY SYSTEM

Fuel Supply System

For all fuel supply system component locations. Refer to --> **20 - FUEL SUPPLY SYSTEM**

For all fuel supply system removal/installation procedures and torque specifications. Refer to --> **20 - FUEL SUPPLY SYSTEM**

Check the Technical Bulletins for information that may supersede any information included in this article.

NOTE:

- **All manufacturers special tools as well as common tools may contain a manufacturer specific part number. These tools may be substituted with an equivalent aftermarket tool or are available for purchase through Audi.**
- **Manufacturers special tools as well as common tools that contain a manufacturer specific part number may be referenced in the test procedure illustrations showing the tool use or installation. If the manufacturer specific tool is not being used, an equivalent aftermarket tool may be installed in the same manner as the manufacturers special tool.**

Safety precautions

CAUTION: The use of nails, paper clips, or another unauthorized materials to back-probe electrical harness connectors is strictly prohibited and may cause damage to the electrical harness connectors, terminal ends or damage to a component. Use only the manufacturers test lead kit or an equivalent aftermarket test lead kit for back-probing all electrical harness connectors.

CAUTION:

- **The fuel system is under pressure! Before opening the system, place rags around the connection area. Then release the pressure by carefully loosening the connection.**
- **The engine section of the fuel system, after the high pressure pump, is under extremely high pressure! When working on the engine or the fuel injection system, the pressure must be relieved to residual pressure before opening the high pressure components --> 24 MULTIPORT FUEL INJECTION (MFI) .**
- **Place sources of flame, e.g. cigarette lighters, as well as those sources of others in the area, out of reach. These can ignite fuel vapors.**

Perform the following steps before beginning work on the fuel supply system:

- Disconnect the battery Ground (GND) cable with the ignition switched off -->
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
  - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for ELECTRICAL EQUIPMENT, CABRIOLET

  .
- Open the fuel filler flap briefly and then close again.

When removing and installing components from full or partially full fuel tanks, observe the following:

- The fuel tank must only be partially full. How much fuel can remain in the fuel tank may be read in the respective work description. Empty the fuel tank if necessary.
- Before starting work, switch on the exhaust extraction system and place an extraction hose close to the installation opening of the fuel tank to extract escaping fuel fumes. If no exhaust extraction system is available, a radial fan (as long as motor is not in air flow) with a displacement greater than 15 m^3/h can be used.
- Prevent fuel from contacting the skin! Wear fuel-resistant gloves!

Rules for cleanliness

When working on the fuel supply/injection system, pay careful attention to the following rules of cleanliness:

- Thoroughly clean all connections and the surrounding area before disconnecting.
- Place parts that have been removed on a clean surface and cover them. Do not use fluffy cloths!
- Carefully cover over opened components or seal, if repairs are not performed immediately.
- Only install clean components: Only unpack replacement parts immediately prior to installation. Do not use parts that have been stored unpacked (e.g. in tool boxes etc.).
- When the system is open: Do not work with compressed air. Do not move vehicle unless absolutely necessary.

Fuel pump electrical, testing

Special tools, testers and auxiliary items required

- Hand held remote control (jumper).
- Multimeter.
- Electrical connector test lead set.

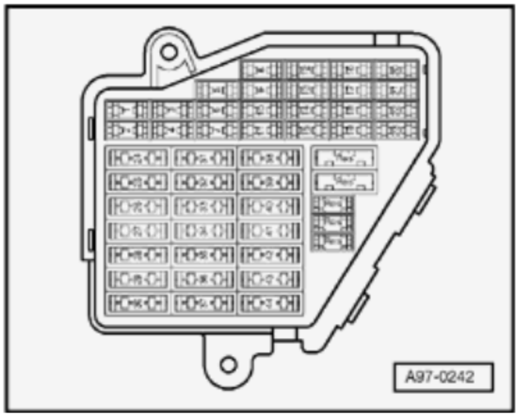

Fig. 1: Identifying Main Fuse Panel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Test conditions

- Battery voltage 12.5 V.
- Fuse - **29** - in fuse holder at left of instrument panel is OK.
- Fuel filter OK.
- Ignition switched off.

Test sequence

- Remove rear seat bench -->
  - **72 - SEAT - FRAMES**
  - **72 - SEAT - FRAMES** for BODY INTERIOR - CABRIOLET

  .

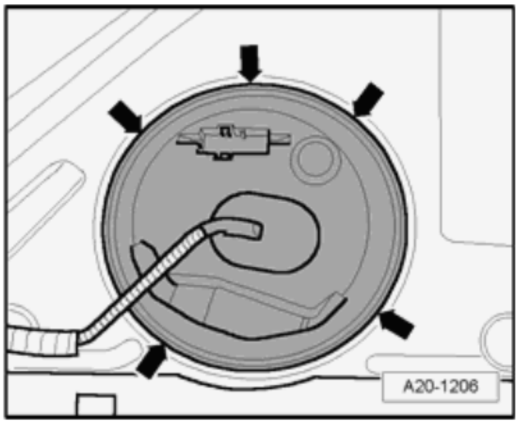

Fig. 2: Identifying Right Sealing Flange Cover Retainers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover retainers - **arrows** - from the right sealing flange.

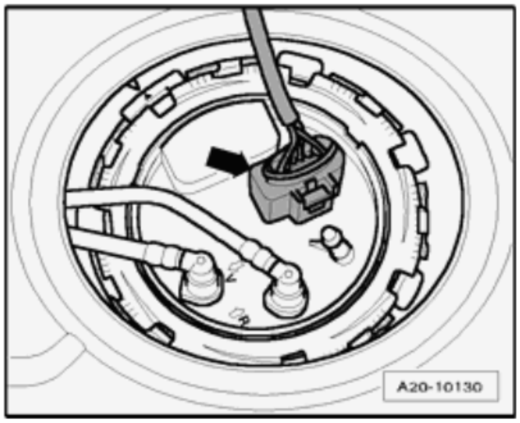

Fig. 3: Disconnecting Electrical Harness Connector From Fuel Delivery Unit
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect the electrical harness connector - **arrow** - from the fuel delivery unit.
- Connect a Hand held remote control (jumper) to terminal - **1** - of the fuel delivery unit and to vehicle battery (+).

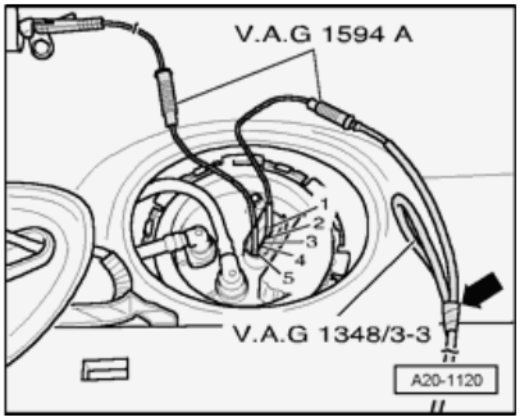

Fig. 4: Connecting Jumper Cable From Electrical Connector Test Lead Set To Terminal 5 Of Fuel Delivery Unit And To Vehicle Ground (GND)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect a jumper cable from a Electrical connector test lead set to terminal - **5** - of the fuel delivery unit and to vehicle Ground (GND).
- Press switch on the Hand held remote control (jumper).

NOTE:

- **The Fuel Pump (FP) runs quietly. Avoid surrounding noises while testing the fuel pump.**

- Listen for an operating noise from the fuel pump.

If no operating noise is heard:

- Remove the fuel delivery unit. Refer to --> **20 - FUEL SUPPLY SYSTEM** .

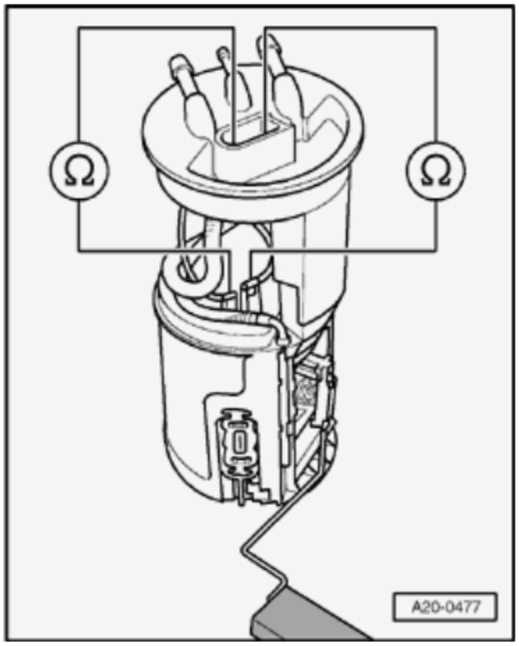

Fig. 5: Checking Electrical Circuit Between Terminals Of Fuel Delivery Unit And Fuel Pump For Continuity
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a Multimeter , check the electrical circuit between terminals - **1** - and - **5** - of the fuel delivery unit for continuity.

Specified value: 0 ohms.

If a malfunction is detected in the electrical circuit:

- Check the wiring for a short circuit to Battery positive (+) or an open circuit.
- Check the electrical harness connector for damage, corrosion, lose or broken terminals.
- If necessary, repair the electrical circuit.
- If no malfunction is detected in electrical circuit, replace the fuel pump. Refer to --> **20 - FUEL SUPPLY SYSTEM** .

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory.
2. If necessary, erase the DTC memory. Refer to **Diagnostic Mode 04: Reset/delete diagnostic data**.
3. If the DTC memory was erased, generate readiness code. Refer to **Readiness Code**.

- **End of diagnosis.**

Fuel Pump (FP) delivery quantity, checking

Special tools, testers and auxiliary items required

- Hand held remote control (jumper).
- Multimeter.
- Electrical connector test lead set.
- Fuel pressure test set (high pressure).

- Measuring container, fuel-resistant.

Test conditions

- Battery voltage 12.5 V
- Fuel filter OK
- Fuel tank at least $^1/_4$ filled.
- Fuel pressure regulator OK.

- Ignition switched off.

Test sequence

- Remove the fuel filler cap from fuel filler tube.
- Remove rear seat bench -->
  - **72 - SEAT - FRAMES**
  - **72 - SEAT - FRAMES** for BODY INTERIOR - CABRIOLET

.

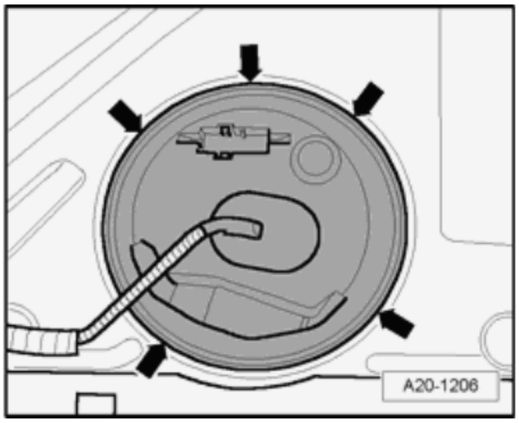

Fig. 6: Identifying Right Sealing Flange Cover Retainers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover retainers - **arrows** - from the right sealing flange.

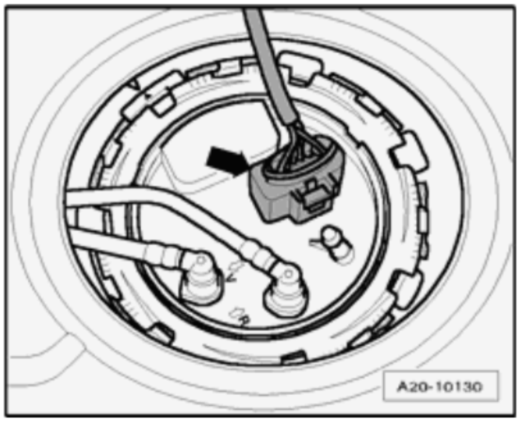

Fig. 7: Disconnecting Electrical Harness Connector From Fuel Delivery Unit
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect the electrical harness connector - **arrow** - from the fuel delivery unit.
- Connect a Hand held remote control (jumper) to terminal - **1** - of the fuel delivery unit and to vehicle battery (+).

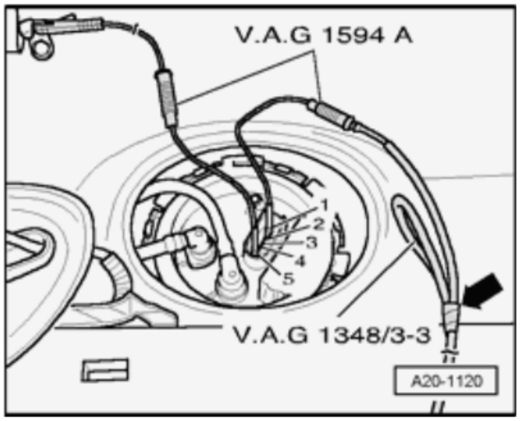

Fig. 8: Connecting Jumper Cable From Electrical Connector Test Lead Set To Terminal 5 Of Fuel Delivery Unit And To Vehicle Ground (GND)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect a jumper cable from a Electrical connector test lead set to terminal - **5** - of the fuel delivery unit and to vehicle Ground (GND).

CAUTION: Fuel system is under pressure! Before opening the system, place rags around the connection area. Then release the pressure by carefully loosening the connection.

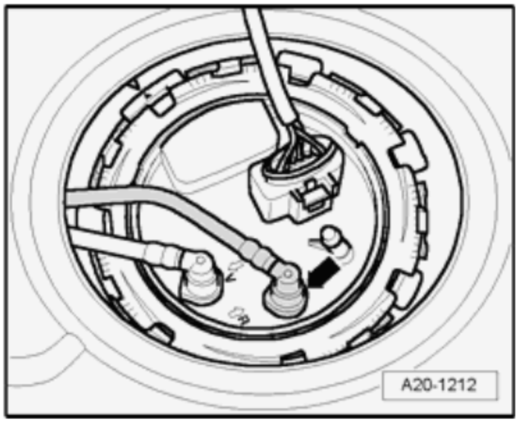

Fig. 9: Disconnecting Fuel Return Line By Pressing Release Buttons
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect the fuel return line - **arrow** - by pressing release buttons.

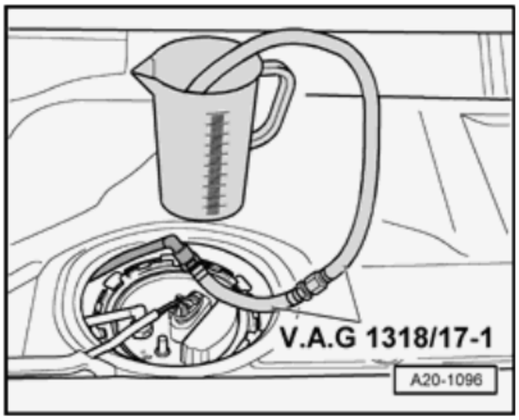

Fig. 10: Fuel Line From The High Pressure Fuel Gauge Connected To The Disconnected Fuel Return Line
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect a fuel line from the Fuel pressure test set (high pressure) to the disconnected fuel return line and hold it in the measuring container.
- Press the switch on the Hand held remote control (jumper) and operate the fuel pump for 15 seconds.

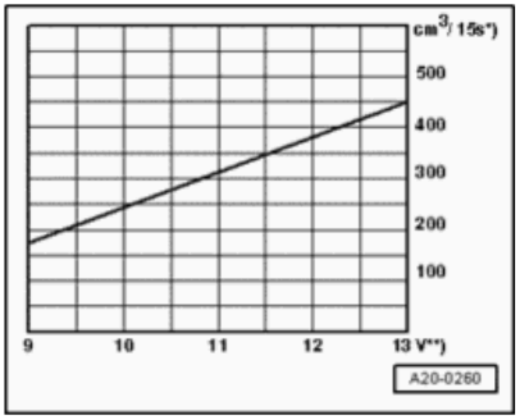

Fig. 11: Delivery Rate Diagram
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Compare quantity of fuel delivered with minimum delivery rate in the diagram (cm ^{3} /15s).

NOTE:
- **Voltage at the fuel pump with engine stopped and fuel pump running is approx. 2 volts less than battery voltage.**

If minimum delivery quantity is not obtained, the following malfunctions may be present:

- Fuel lines pinched.
- Fuel filter plugged.
- Fuel pump faulty.

- If necessary, repair any pinched or plugged lines.
- Replace the fuel filter. Refer to --> **20 - FUEL SUPPLY SYSTEM** .
- Replace the fuel pump. Refer to --> **20 - FUEL SUPPLY SYSTEM** .

Assembly is performed in reverse order of removal. Note the following:

- Install the rear seat bench -->
  - **72 - SEAT - FRAMES**
  - **72 - SEAT - FRAMES** for BODY INTERIOR - CABRIOLET

  .

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory.
2. If necessary, erase the DTC memory. Refer to **Diagnostic Mode 04: Reset/delete diagnostic data**.
3. If the DTC memory was erased, generate readiness code. Refer to **Readiness Code**.

- **End of diagnosis.**

EVAPORATIVE EMISSIONS (EVAP) SYSTEM

Evaporative Emissions (EVAP) System

For all EVAP system component locations and hose routing. Refer to --> **20 - FUEL SUPPLY SYSTEM**

For the EVAP system hose routing. Refer to --> **20 - FUEL SUPPLY SYSTEM**

For all EVAP system removal/installation procedures and torque specifications. Refer to --> **20 - FUEL SUPPLY SYSTEM**

Check the Technical Bulletins for information that may supersede any information included in this article.

NOTE:

- **All manufacturers special tools as well as common tools may contain a manufacturer specific part number. These tools may be substituted with an equivalent aftermarket tool or are available for purchase through Audi.**
- **Manufacturers special tools as well as common tools that contain a manufacturer specific part number may be referenced in the test procedure illustrations showing the tool use or installation. If the manufacturer specific tool is not being used, an equivalent aftermarket tool may be installed in the same manner as the manufacturers special tool.**
- **The manufacturers test box Test Box 105 Pin VAG1598/31 is available for purchase or rental.**

EVAP system, leak detection

Function

The leak detection system recognizes leaks in the complete fuel system, including the fuel tank, EVAP canister and the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80.

On the mechanical side, the leak detection system consists mainly of a vacuum-driven diaphragm pump equipped with a reed contact on the actuation rod of the pump diaphragm. The pump is supplied with vacuum via the engine intake stroke.

- When leak detection is activated, the diaphragm pump pumps the fuel system up to 20 30 mbar. The pump diaphragm is then moved out so that the reed contact at the operating rod remains in the "open" position.
- During the leak diagnosis, the reed contact is monitored to check if it remains open within 10 seconds. This indicates the system is sealed.
- If the pressure falls (indicating a leak), the diaphragm moves back and the reed contact closes.
- If the reed contact closes within 10 seconds of leak detection time, a further test is performed: In this case

the diaphragm pump pumps four times again. The Motronic Engine Control Module (ECM) J220 measures the time for each of the four pumps until the reed contact is closed again. From that, the control module can recognize a "small leak" (greater than 1 mm in diameter) or a "large leak".

Leak diagnosis is activated automatically shortly following every engine start. If a malfunction is determined, an entry is made to the Diagnostic Trouble Code (DTC) memory. The Malfunction Indicator Lamp (MIL) K83 in the instrument cluster lights up if the malfunction is recognized for two subsequent starts.

Evaporative Emission (EVAP) canister system, checking for proper seal

NOTE:

- **Secure all hose connections using hose clamps appropriate for the model type .**
- **Replace seals and gaskets when performing repair work.**

Test sequence

- Connect the scan tool.
- Start the engine and let run at idle for at least 15 minutes.
- Select "Diagnostic mode 8: Tank leak test".
- Select the "OBDMID 01: Tank leak test" and check the specified value at idle.

Specified value: test OK

NOTE:

- **If the accelerator pedal is depressed during the test, the test will be aborted.**
- **To repeat the tank leak-tightness test, switch the ignition off, start the engine again, and let it run at idle.**

If the specified value is obtained:

- End diagnosis and switch the ignition off.

If the specified value is not obtained:

Checking fuel supply and tank ventilation systems for leaks

- Ensure the fuel filler cap is properly installed on the fuel tank.
- Check the fuel filler cap seal for damage. Replace if necessary.
- Remove the rear seat bench -->
  - **72 - SEAT - FRAMES**
  - **72 - SEAT - FRAMES** for BODY INTERIOR - CABRIOLET

.

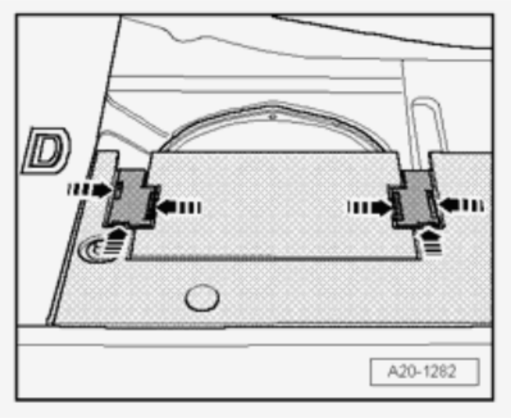

Fig. 12: Releasing Retaining Tabs
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release the retaining tabs - **arrows** -.
- Release the retaining tabs - **1** - and - **3** -.

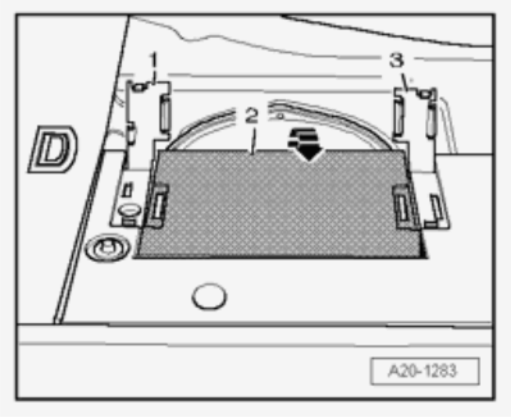

Fig. 13: Folding Cover Toward Front
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift the cover - **2** - toward the front - **arrow** -.

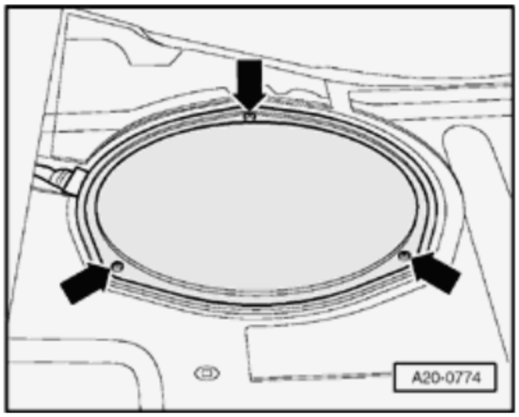

Fig. 14: Unbolting Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt the cover - **arrows** -.

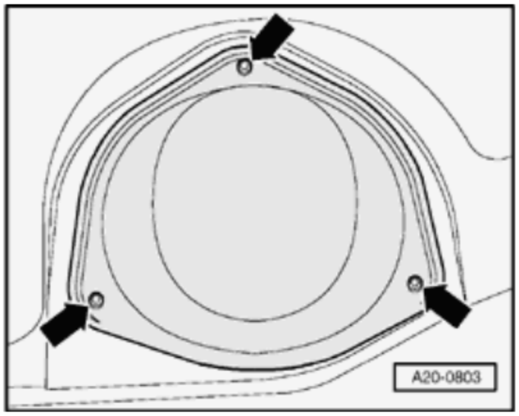

Fig. 15: Removing Cover Bolts For Locking Flange
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove the bolts - **arrows** - and cover.
- Check the seals under the locking flanges are OK and the union nuts are properly tightened on the fuel tank. Also check the fuel line connections.
- Visually check all hose connections of the fuel supply system and replace any leaking lines, e.g:

- Check the line from the EVAP canister to the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80.
- Check the lines from the EVAP canister to the Leak Detection Pump (LDP) V144.
- Check the line from the fuel tank to the EVAP canister (below cover for EVAP canister).
- Check the lines for the tank ventilation (beneath right rear wheel housing liner).

- Check the fuel lines to the engine.

NOTE:

- **Leaks at the lines and components of the fuel tank ventilation system can sometimes be located using a non-flammable, environmentally compliant leak detection spray. Initiate the leak diagnosis several times in sequence to build up pressure in the system. At leaking areas, bubbles will form.**

- Repeat the function test.

If a leak is detected:

- Perform a visual inspection on the fuel system components and tank ventilation system.

- Fuel tank.

- EVAP canister.
- Leak Detection Pump (LDP) V144.
- Evaporative Emission (EVAP) Canister Purge Regulator Valve N80.

NOTE:

- **Due to the form or function of the components, leaking areas may not always be localized by spraying on the leak detection spray. It may be necessary to clamp off the relevant component using Hose Clamps Up To 25mm Dia. and initiate the tank leak detection diagnostic. If the leak is no longer indicated, the component that was clamped off is faulty. If clamped off directly at the leak detection pump and a leak is still indicated, the leak detection pump itself is leaking.**

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory.
2. If necessary, erase the DTC memory. Refer to **Diagnostic Mode 04: Reset/delete diagnostic data**.
3. If the DTC memory was erased, generate readiness code. Refer to **Readiness Code**.

   - **End of diagnosis.**

Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 , checking (AMB Engine Code)

Special tools, testers and auxiliary items required

- Multimeter.
- Wiring diagram.

Test requirements

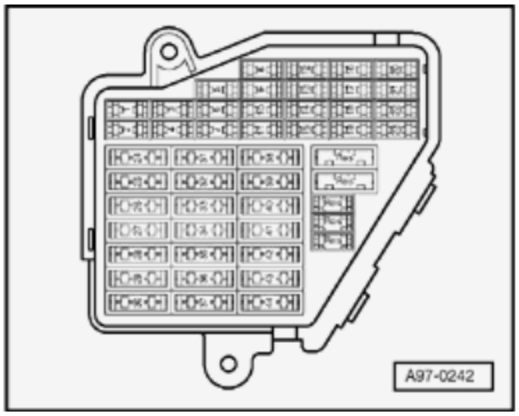

Fig. 16: Identifying Main Fuse Panel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 fuse OK.
- The ignition switched off.

NOTE:

- **Voltage for the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 is supplied via the Engine Component Power Supply Relay J757.**

Procedure

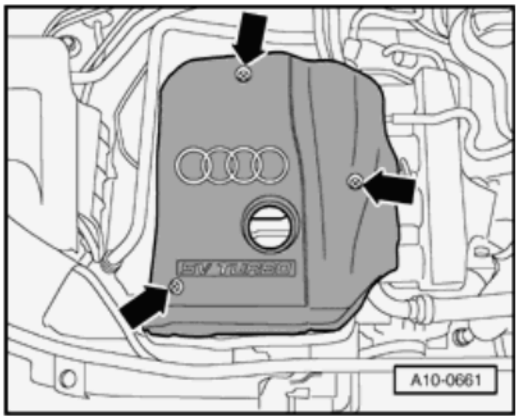

Fig. 17: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove the engine cover with air filter --> **24 MULTIPORT FUEL INJECTION (MFI)** .

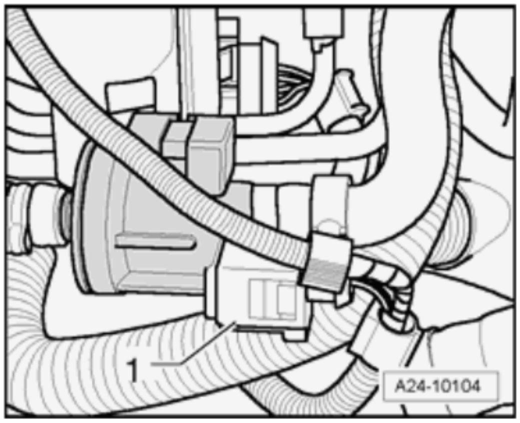

Fig. 18: Identifying Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 Electrical Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 electrical harness connector - **1** -.

Checking internal resistance

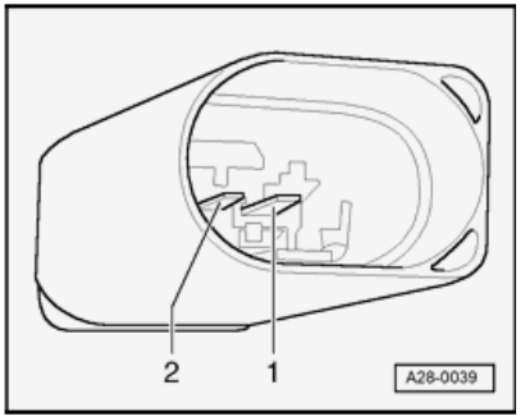

Fig. 19: Identifying 2-Pin Electrical Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a Multimeter , check the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 terminals 1 and 2 for resistance.

Specified value: 22.0 to 30.0 ohms.

If the specified value is not obtained:

- Replace the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80.

If the specification is obtained:

Checking voltage supply

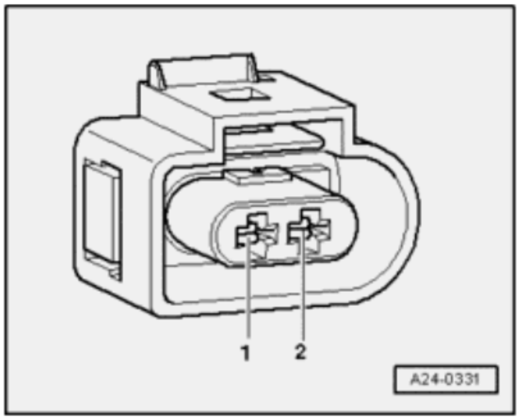

Fig. 20: Identifying 2-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a Multimeter , check the electrical harness connector terminal 1 to 2 for voltage.
- Operate the starter briefly.

Specified value: battery voltage.

If the specified value was not obtained:

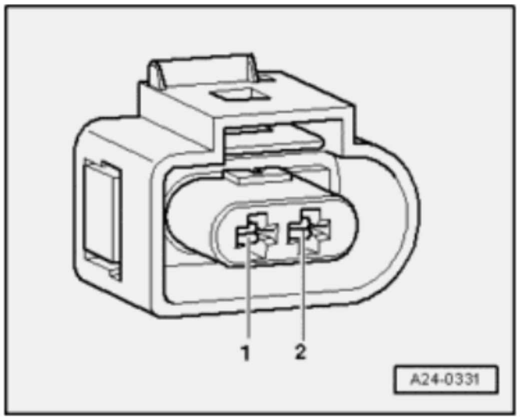

Fig. 21: Identifying 2-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a Multimeter , check the electrical harness connector terminal 1 for voltage.

Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 electrical harness connector terminal	Measure to
1	Engine Ground (GND)

- Operate the starter briefly.

Specified value: battery voltage.

If the specified value is not obtained:

- Check the wiring connection from terminal 2 of Fuel Pump Relay J17 to pin 1 of N80 connector for an open circuit.
- Check the electrical harness connector for damage, corrosion, lose or broken terminals.
- If necessary, repair the wiring connection.

If the specified value was obtained:

Check Ground (GND) activation

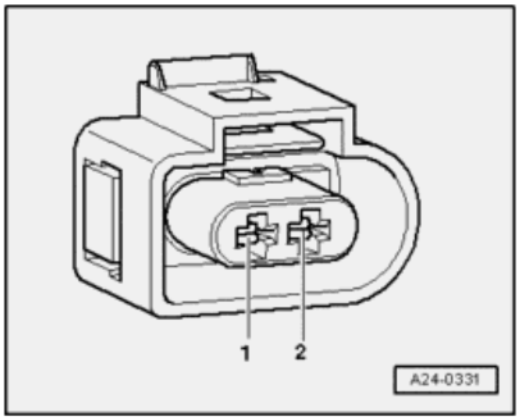

Fig. 22: Identifying 2-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a Multimeter , check the electrical harness connector for voltage.

Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 electrical harness connector terminal	Measure to
2	Battery positive (+)

- Operate the starter briefly.

Specified value: battery voltage.

- Switch the ignition off.

If the specified value was not obtained:

If the manufacturers test box is being used. Perform the following step.

- Install the test box. Refer to --> **24 MULTIPORT FUEL INJECTION (MFI)** .

If the manufacturers test box is not being used. Perform the following step.

- Remove the Motronic Engine Control Module (ECM) J220. Refer to --> **Motronic Engine Control Module (ECM) J220 , replacing** .

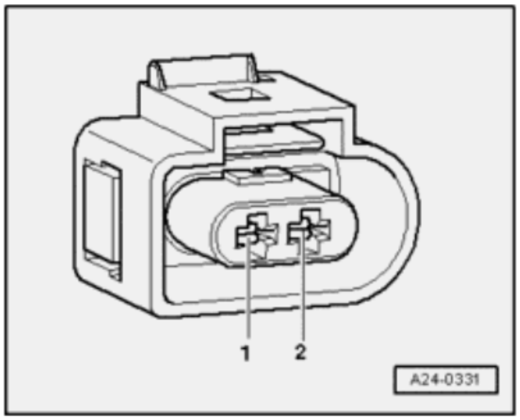

Fig. 23: Identifying 2-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a Multimeter , check the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 electrical connector terminal 2 to Motronic Engine Control Module (ECM) J220 electrical connector terminal 64 for an open circuit.

Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 electrical harness connector terminal	Motronic Engine Control Module (ECM) J220 electrical connector test box socket
2	64

Specified value: 1.5 ohms max.

If the specification is not obtained:

- Check the wiring for a short circuit to Battery positive (+) or an open circuit.
- Check the electrical harness connector for damage, corrosion, lose or broken terminals.
- If necessary, repair the wiring connection.

If the specification was obtained:

- Replace the Motronic Engine Control Module (ECM) J220. Refer to --> **Motronic Engine Control Module (ECM) J220 , replacing** .
- Install the engine cover with air filter --> **24 MULTIPORT FUEL INJECTION (MFI)** .

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory.
2. If necessary, erase the DTC memory. Refer to **Diagnostic Mode 04: Reset/delete diagnostic data**.
3. If the DTC memory was erased, generate readiness code. Refer to **Readiness Code**.

- **End of diagnosis.**

Leak Detection Pump (LDP) V144 , checking (AMB Engine Code)

Special tools, testers and auxiliary items required

- Multimeter.
- Wiring diagram.

Test requirements

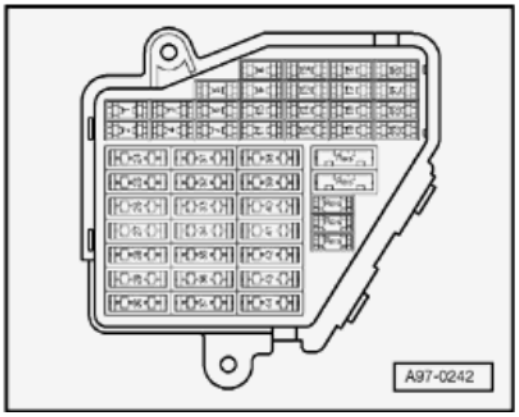

Fig. 24: Identifying Main Fuse Panel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The Leak Detection Pump (LDP) V144 fuse OK.
- The ignition switched off.

Procedure

- Remove the left rear wheel housing liner. -->
    - **66 EXTERIOR EQUIPMENT**
    - **66 - EXTERIOR EQUIPMENT** for BODY EXTERIOR - CABRIOLET

  .

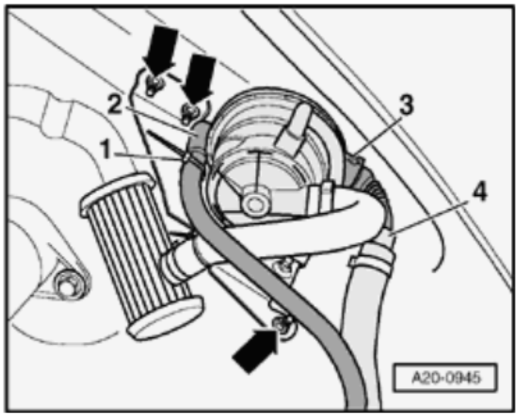

Fig. 25: Disconnecting Leak Detection Pump (LDP) V144 Electrical Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect the Leak Detection Pump (LDP) V144 electrical harness connector - **2** -.

Checking internal resistance

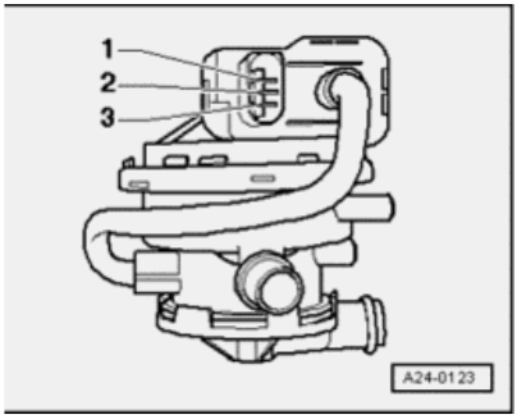

Fig. 26: Locating 3-Pin Connector At Fuel System Leak Detection Pump V144
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a Multimeter , check the Leak Detection Pump (LDP) V144 for resistance as follows:

Leak Detection Pump (LDP) V144 electrical harness connector terminals	Specified values
- **1** - + - **3** -	640 to 720 ohms
- **2** - + - **3** -	15 to 17 ohms

If any of the specifications are not obtained:

- Replace the Leak Detection Pump (LDP) -V144-. --> **20 - FUEL SUPPLY SYSTEM** .

If the specified values are obtained:

Checking voltage supply

NOTE:

- **The voltage for the Leak Detection Pump (LDP) -V144- is supplied via the Engine Control Module (ECM) J220.**

- Check the Leak Detection Pump (LDP) -V144- for voltage.

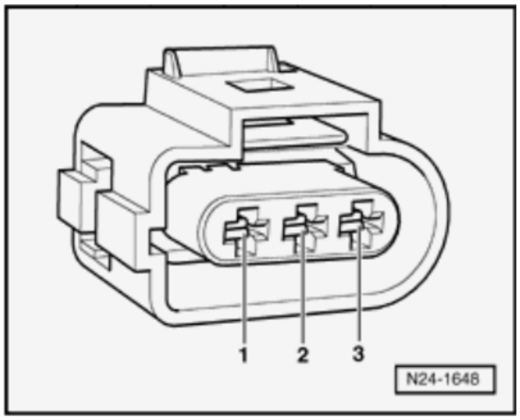

Fig. 27: Identifying 3-Pin Electrical Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a Multimeter , check the Leak Detection Pump (LDP) -V144- electrical harness connector terminal 3 for voltage.

Leak Detection Pump (LDP) -V144- electrical harness connector terminal	Measure to
- **3** -	Engine Ground (GND)

- Operate the starter briefly.

Specified value: battery voltage.

- Switch the ignition off.

If the specified value was not obtained:

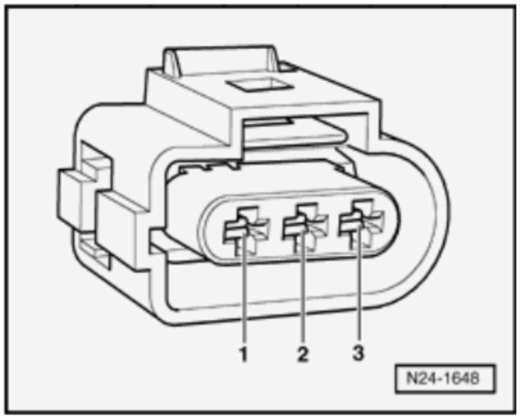

Fig. 28: Identifying 3-Pin Electrical Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a Multimeter , check the Leak Detection Pump (LDP) -V144- electrical harness connector terminal 3 to the Fuel Pump Relay J17 terminal 2 for an open circuit.

Specified value: Wire resistance max 1.5 ohms.

If the specification is not obtained:

- Check the wiring for a short circuit to Battery positive (+) or an open circuit.
- Check the electrical harness connector for damage, corrosion, lose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring and if the voltage supply was OK:

Checking wiring

If the manufacturers test box is being used. Perform the following step.

- Install the test box. Refer to --> **24 MULTIPORT FUEL INJECTION (MFI)** .

If the manufacturers test box is not being used. Perform the following step.

- Remove the Motronic Engine Control Module (ECM) J220. Refer to --> **Motronic Engine Control Module (ECM) J220 , replacing** .
- Using a Multimeter , check the Leak Detection Pump (LDP) -V144- electrical connector terminal 1 to Motronic Engine Control Module (ECM) J220 electrical connector terminal 80 for an open circuit.

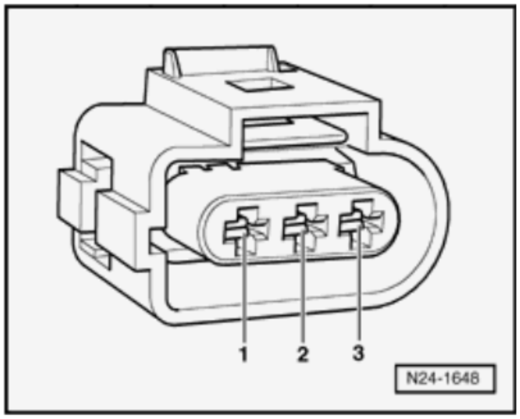

Fig. 29: Identifying 3-Pin Electrical Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a Multimeter , check the Leak Detection Pump (LDP) -V144- electrical connector terminal 2 to Motronic Engine Control Module (ECM) J220 electrical connector terminal 25 for an open circuit.

Leak Detection Pump (LDP) -V144- electrical harness connector terminals	Motronic Engine Control Module (ECM) J220 electrical connector terminals or test box socket
1	80
2	25

Specified value: 1.5 ohms max.

If the specification is not obtained:

- Check the wiring for a short circuit to Battery positive (+) or an open circuit.
- Check the electrical harness connector for damage, corrosion, lose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is found in wiring:

- Replace the Motronic Engine Control Module (ECM) J220. Refer to --> **Motronic Engine Control Module (ECM) J220 , replacing** .

Assembly is performed in the reverse order of the removal, note the following:

- Install the left rear wheel housing liner -->
  - **66 EXTERIOR EQUIPMENT**
  - **66 - EXTERIOR EQUIPMENT** for BODY EXTERIOR - CABRIOLET

  .

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory.
2. If necessary, erase the DTC memory. Refer to **Diagnostic Mode 04: Reset/delete diagnostic data**.
3. If the DTC memory was erased, generate readiness code. Refer to **Readiness Code**.

- **End of diagnosis.**

ELECTRONIC ENGINE POWER CONTROL (EPC)

Function of "EPC" system

For "EPC" , the throttle valve is not operated by a cable from the accelerator pedal. There is no mechanical connection between the accelerator pedal and the throttle valve.

The position of the accelerator pedal is communicated to Motronic Engine Control Module (ECM) J220 via Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 (variable resistances; stored in one housing) that are connected with the accelerator pedal.

The accelerator pedal position (drivers intention) is a main input unit for the Motronic Engine Control Module (ECM) J220.

Operation of the throttle valve occurs via an electric motor (Throttle Drive (for Electronic Power Control (EPC)) G186) in the Throttle Valve Control Module J338. This is true across the entire engine speed and engine load spectrum.

Throttle valve is operated by Throttle Drive (for Electronic Power Control (EPC)) G186 according to specifications of Motronic Engine Control Module (ECM) J220.

With engine off and ignition switched on, Motronic Engine Control Module (ECM) J220 controls the Throttle Drive (for Electronic Power Control (EPC)) G186 exactly according to specifications of Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185. This means, if the accelerator pedal is depressed half way, the Throttle Drive (for Electronic Power Control (EPC)) G186 opens the throttle valve to the same degree; i.e. throttle valve is then opened approx. half way.

With engine running (under load), Motronic Engine Control Module (ECM) J220 can open or close the throttle valve independently of Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185.

This means, for example, that the throttle valve could be fully opened even though the accelerator pedal has only been depressed half way. This has the advantage of preventing torque losses at the throttle valve.

In addition to this, it results in significantly better values relative to emissions and consumption under certain load conditions.

It would be incorrect to think that "EPC" consists of only one or two components. "EPC" is much more of a system containing all components that contribute to recognizing, controlling and monitoring the position of the throttle valve.

- Observe all safety precautions.
- Observe the rules for cleanliness.

Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking (Engine Code AMB)

Special tools, testers and auxiliary items required

- Multimeter.
- Wiring diagram

Test requirement

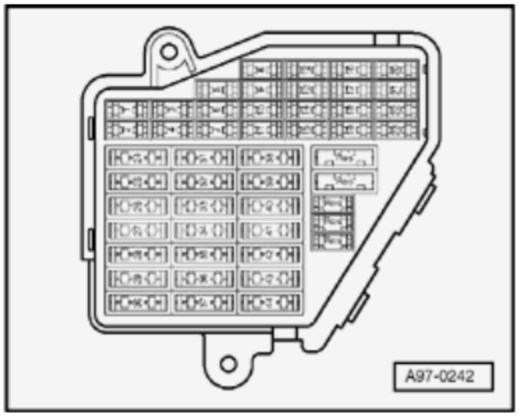

Fig. 30: Identifying Main Fuse Panel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The Motronic Engine Control Module (ECM) J220 fuses OK.
- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".

- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.

NOTE:

- **Use only gold-plated terminals when servicing the electrical harness connector terminals in Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185.**

Test sequence

- Remove the drivers side storage compartment. Refer to -->
  - **68 - INTERIOR EQUIPMENT**
  - **68 - INTERIOR EQUIPMENT** for BODY INTERIOR - CABRIOLET

.

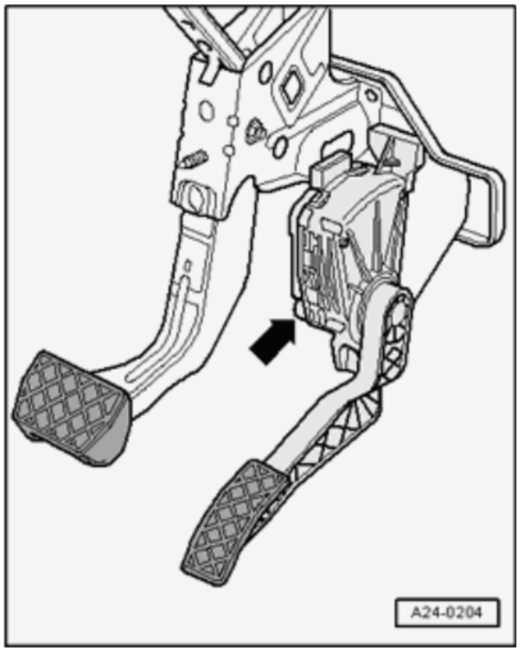

Fig. 31: Kick Down Switch F8
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect the Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 6-pin electrical harness connector - **2** -.

Checking voltage supply and wiring

- Switch the ignition on.

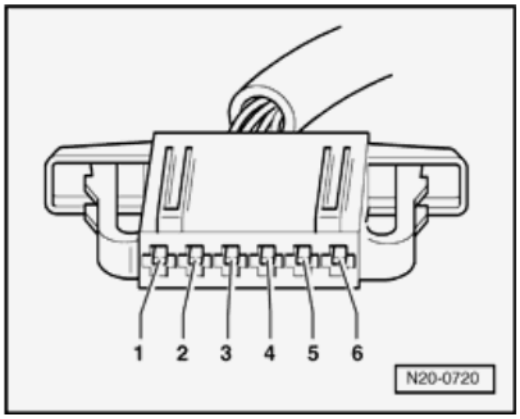

Fig. 32: Identifying 6-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a Multimeter , check the following wiring connections for voltage.

Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 electrical harness connector terminals	Specified value
1 to Ground (GND)	about 5 V
1 to 5	about 5 V
2 to Ground (GND)	about 5 V
2 to 3	about 5 V

- Switch the ignition off.

If the specification was not obtained:

If the manufacturers test box is being used. Perform the following step.

- Install the test box. Refer to --> **24 MULTIPORT FUEL INJECTION (MFI)** .

If the manufacturers test box is not being used. Perform the following step.

- Remove the Motronic Engine Control Module (ECM) J220. Refer to --> **Motronic Engine Control Module (ECM) J220 , replacing** .

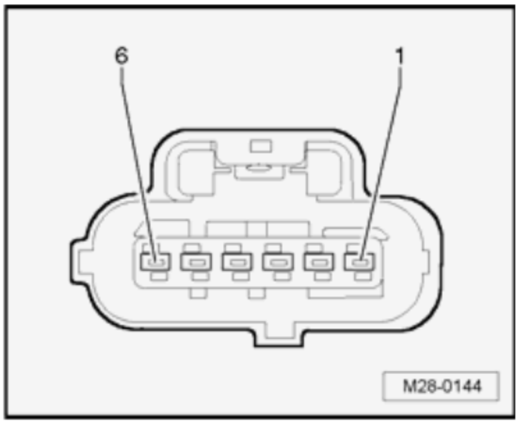

Fig. 33: Identifying 6-Pin Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a Multimeter , check the Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 electrical harness connector terminals to the Motronic Engine Control Module (ECM) J220 electrical connector for an open circuit.

Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 electrical harness connector terminals	Motronic Engine Control Module (ECM) J220 electrical connector test box sockets
1	72
2	73

3	36
4	35
5	33
6	34

Specified value: 1.5 ohms max.

If the specification is not obtained:

- Check the wiring for a short circuit to each other, Battery (+), and Ground (GND).
- Check the electrical harness connector for damage, corrosion, lose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring and if the voltage supply was OK:

- Replace the Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185. --> **20 - FUEL SUPPLY SYSTEM** .

If no malfunction is detected in the wiring and if the voltage supply was not OK:

- Replace the Motronic Engine Control Module (ECM) J220. Refer to --> **Motronic Engine Control Module (ECM) J220 , replacing** .
- Install the drivers side storage compartment. Refer to -->
    - **68 - INTERIOR EQUIPMENT**
    - **68 - INTERIOR EQUIPMENT** for BODY INTERIOR - CABRIOLET

  .

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory.
2. If necessary, erase the DTC memory. Refer to **Diagnostic Mode 04: Reset/delete diagnostic data**.
3. If the DTC memory was erased, generate readiness code. Refer to **Readiness Code**.

- **End of diagnosis.**

. .

24 MULTIPORT FUEL INJECTION (MFI)

MOTRONIC INJECTION SYSTEM, SERVICING

Safety precautions

WARNING: **To reduce the risk of personal injury and/or damage to the fuel injection and ignition system, always observe the following:**

- **Only disconnect and reconnect wires for injection and ignition system, including test leads, when ignition is turned off.**
- **If engine is to be cranked at starting RPM without starting (e.g. for compression testing), disconnect connector from ignition coils and from fuel injectors.**
- **Always attach testers and measuring instruments to the back seat and have a second person operate them from there.**
- **It is possible that the control module will recognize a malfunction and store a DTC during some tests. After completing all tests and repairs, DTC memory should therefore be checked and erased if necessary.**

- **Always switch ignition off before cleaning engine.**
- **The battery should only be disconnected and reconnected when the ignition is turned off, since otherwise the Engine Control Module (ECM) can be damaged.**

If special testing equipment is required during test drive, observe the following:

WARNING:

- **If test equipment is operated from the front passenger seat, the person sitting there could be injured if the front passenger airbag were triggered in the event of an accident.**
- **Use only the VAS 5051 to read measured value blocks. Always secure the tester to the rear seat and operate it from there by a second technician.**

WARNING: **The fuel system is pressurized! Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.**

Rules for cleanliness

When working on the fuel supply or fuel injection systems, the following "6 rules of cleanliness" should be carefully observed:

- Thoroughly clean all connections and the surrounding area before disconnecting.
- Place parts that have been removed on a clean surface and cover. Use lint-free cloths only!
- Carefully cover opened components or seal them if repairs are not carried out immediately.
- Only install clean components: Only unpack replacement parts immediately prior to installation. Do not use parts that have been stored loose (in tool boxes etc.).
- When the system is open: Do not work with compressed air if it can be avoided. Do not move vehicle unless absolutely necessary.
- Disconnected electrical harness connectors: Protect from dirt and moisture. Be sure harness connector is dry before connecting.

Technical data

Engine code letters		**AMB (1.8 l/5V/125 kW-engine)**
Idle speed Not adjustable - controlled by the idling speed stabilization	FWD AWD	700 to 860 RPM
Engine speed limitation by deactivation of injectors		approx. 6800 RPM
Fuel pressure at idle speed		approx. 4.0 bar
Holding pressure after 10 minutes		at least 2.5 bar
Injectors	Spray pattern	Two-hole nozzle/same for all injectors
	Injection quantity (30 s)	135 ± 10 ml.
	Resistance (ambient temperature)	12 to 13 ohms

Component locations, overview

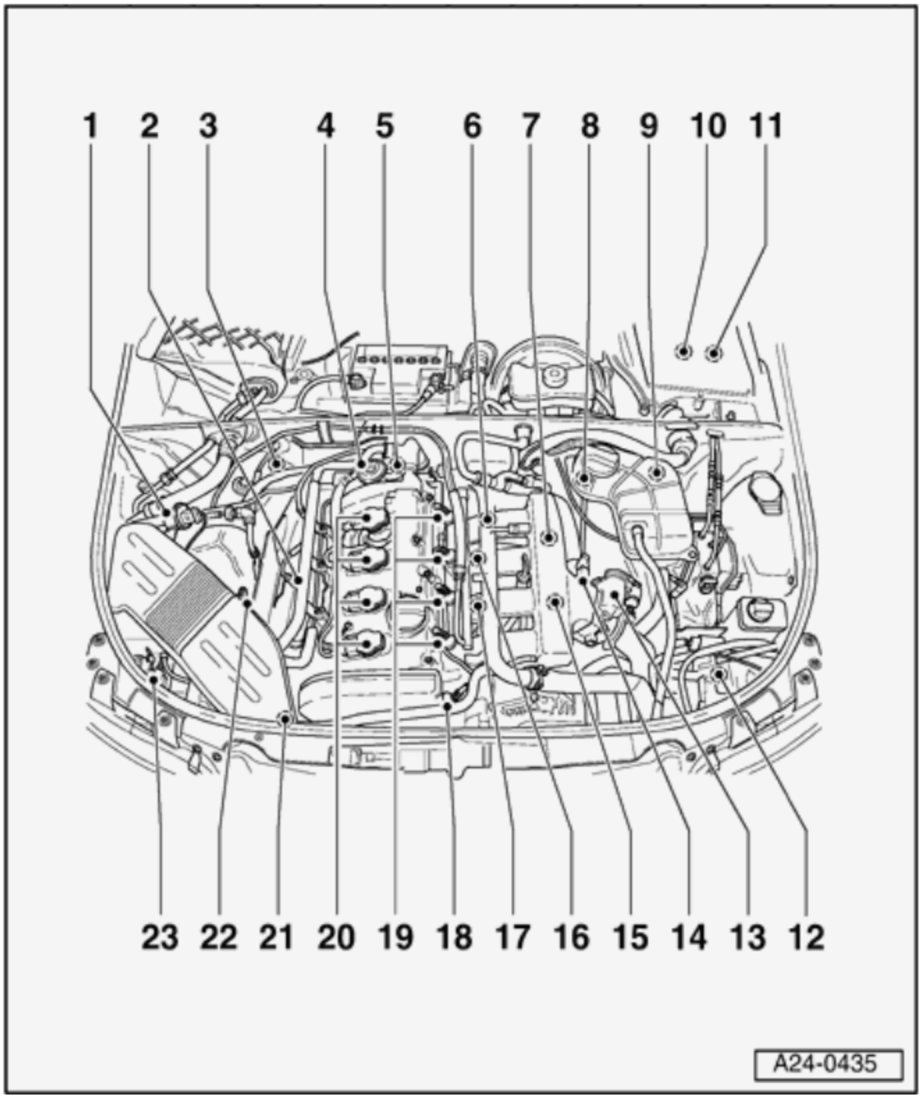

Fig. 79: Motronic Injection System Component Locations, Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Components A to F are not shown in the exploded view.

A - Brake Light Switch -F- and Brake Vacuum Vent Valve Switch -F47-

- In footwell on pedal bracket near brake pedal

B - Data Link Connector (DLC)

- In knee protection on driver's side

C - Fuel Pump (FP) Relay -J17-

- In the micro-central electrics behind storage compartment on driver' side, relay position 4

- Installation location. See **Location of Fuel Pump (FP) Relay -J17-**

D - Clutch Vacuum Vent Valve Switch -F36-

- In footwell on pedal bracket near brake pedal

E - Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-

- In footwell on accelerator pedal (both sensors are located in one housing)

F - Electronic Power Control (EPC) warning lamp -K132-

- In instrument cluster
- With Electronic Power Control (EPC) warning lamp -K132-. Notes for EPC warning lamp. Refer to **Electronic Power Control (EPC) warning lamp -K132- in instrument cluster**
- With exhaust Malfunction Indicator Lamp (MIL). Notes for Malfunction Indicator Lamp (MIL). Refer to **Malfunction Indicator Lamp (MIL) -K83- in instrument cluster**

1 - Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-

- Checking. Refer to **Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, checking**

2 - Heated Oxygen Sensor (HO2S) -G39- 55 Nm

- Constant oxygen sensor
- Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). Refer to **Oxygen Sensor (O2S) and Oxygen Sensor control before catalytic converter, checking**
- Check oxygen sensor aging of oxygen sensor before catalytic converter. Refer to **Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC), checking**
- Check oxygen sensor heating for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). Refer to **Oxygen Sensor (O2S) heater -Z19- for oxygen sensor before Three Way Catalytic Converter (TWC), checking**

- Removing and installing. Refer to **Oxygen Sensor (O2S), removing and installing**

3 - Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- 55 Nm

- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). Refer to **Oxygen Sensor (O2S) and Oxygen Sensor control before Three Way Catalytic Converter (TWC), checking**
- Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). Refer to **Oxygen Sensor (O2S) heater 1 -Z29- behind Three Way Catalytic Converter (TWC), checking**
- Removing and installing. Refer to **Oxygen Sensor (O2S), removing and installing**

4 - Combi valve for secondary air inlet

- Checking, removing and installing:

Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS** , Check Secondary Air Injection (AIR) system

5 - Engine Coolant Temperature (ECT) Sensor -G62-

- Checking. Refer to **Engine Coolant Temperature (ECT) sensor -G62-, checking**
- If necessary, release pressure of cooling system before removing

6 - Engine Speed (RPM) Sensor -G28-

- Checking. Refer to **Engine speed (RPM) sensor -G28-, checking**

7 - Secondary Air Injection (AIR) Solenoid Valve -N112-

- Location. See **Location of Secondary Air Injection (AIR) Solenoid Valve -N112- and Recirculating valve for turbocharger -N249-**
- Checking:

Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS** , Check Secondary Air Injection (AIR) system

- Connector green

8 - Bracket for connectors

- Location. See **Locations on connector bracket**
- Accessible with coolant expansion tank removed and moved to side

9 - Bracket for connectors

- Location. See **Locations on connector bracket**
- Accessible with coolant expansion tank removed and moved to side

10 - Electronics box (plenum chamber)

- Location for Motronic Engine Control Module (ECM) -J220- with Barometric Pressure (BARO) Sensor -F96-
- Location for Motronic Engine Control Module (ECM) Power Supply Relay -J271-
- Installation locations. See **Location of Engine Control Module (ECM) in electronics box (plenum chamber)** and **Component locations in electronics box (plenum chamber).**
- Check voltage supply of Engine Control Module (ECM). Refer to **Motronic Engine Control Module (ECM) power supply, checking**

- Procedure to follow after open circuit in voltage supply. Refer to **Procedure after interruption of voltage supply**
- Replacing Engine Control Module (ECM). Refer to **Engine Control Module (ECM) (without metal anti-theft housing), replacing**
- Component location for Engine Electronics Fuse -S282- for Motronic

11 - Electronics box (plenum chamber)

- Location for Secondary Air Injection (AIR) Pump Relay -J299-
- Check Secondary Air Injection (AIR) Pump Relay -J299-:

Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS** , Check Secondary Air Injection (AIR) system

12 - Charge Air Pressure Sensor -G31-

- Location: Charge Air Pressure Sensor -G31- is installed into top of charge air cooler
- Checking:

Refer to **21 - TURBOCHARGER, G-CHARGER** , Checking charge air system with exhaust gas turbocharger

13 - Throttle Valve Control Module -J338-

- With Throttle drive (power accelerator activation) -G186-, Angle sensor -1- for throttle drive (power accelerator activation) -G187- and Angle sensor -2- for throttle drive (power accelerator activation) -G188-
- Checking. Refer to **Throttle Valve Control Module -J338-, checking**
- When replacing, perform adaptation. Refer to **Throttle Valve Control Module -J338-, adapting**

14 - Intake Air Temperature (IAT) Sensor -G42-

- Checking. Refer to **Intake Air Temperature (IAT) sensor -G42-, checking**

15 - Recirculating valve for turbocharger -N249-

- Location. See **Location of Secondary Air Injection (AIR) Solenoid Valve -N112- and Recirculating valve for turbocharger -N249-**
- Checking:

Refer to **21 - TURBOCHARGER, G-CHARGER**

16 - Knock Sensor (KS) 1 -G61-

17 - Knock Sensor (KS) 2 -G66-

18 - Camshaft Position (CMP) Sensor -G40-

- Checking. Refer to **Camshaft Position (CMP) sensor -G40-, checking**

19 - Fuel Injectors

- Cylinder 1 Fuel Injector -N30-
- Cylinder 2 Fuel Injector -N31-
- Cylinder 3 Fuel Injector -N32-
- Cylinder 4 Fuel Injector -N33-

- Checking. Refer to **Fuel injectors, checking**
- Removing and installing. Refer to **Fuel injectors, removing and installing**

20 - Ignition Coils

- Ignition Coil 1 with Power Output Stage -N70-
- Ignition Coil 2 with Power Output Stage -N127-
- Ignition Coil 3 with Power Output Stage -N291-
- Ignition Coil 4 with Power Output Stage -N292-

- Checking. Refer to **Ignition coils with power output stages, checking**

21 - Wastegate Bypass Regulator Valve -N75-

- Checking:

Refer to **21 - TURBOCHARGER, G-CHARGER** , Checking charge air system with exhaust gas turbocharger

22 - Mass Air Flow (MAF) Sensor -G70-

- Checking. Refer to **Mass Air Flow (MAF) sensor -G70-, checking**

23 - Secondary Air Injection (AIR) Pump Motor -V101-

- Checking:

Refer to **26 - EXHAUST SYSTEM, EMISSION CONTROLS** , Check Secondary Air Injection (AIR) system

Locations on connector bracket

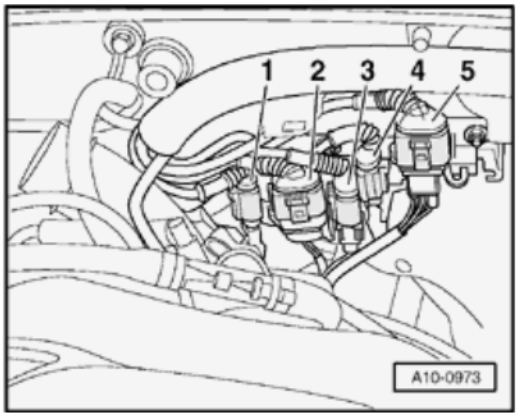

Fig. 80: Identifying Connectors For Oxygen Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The following connections are located underneath the coolant expansion tank:

1 - 3-pin connector, blue

For Knock Sensor (KS) 2 -G66-

1 - 4-pin connector, brown

For Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- and Oxygen Sensor (O2S) Heater 1 -Z29- (bank 1, sensor 2)

3 - 3-pin connector, grey

For Engine Speed (RPM) Sensor -G28-

4 - 3-pin connector, green

For Knock Sensor (KS) 1 -G61-

5 - 6-pin connector, black

For Oxygen Sensor (O2S) -G39- and Oxygen Sensor (O2S) Heater -Z19- (bank 1, sensor 1)

Location of Fuel Pump (FP) Relay -J17-

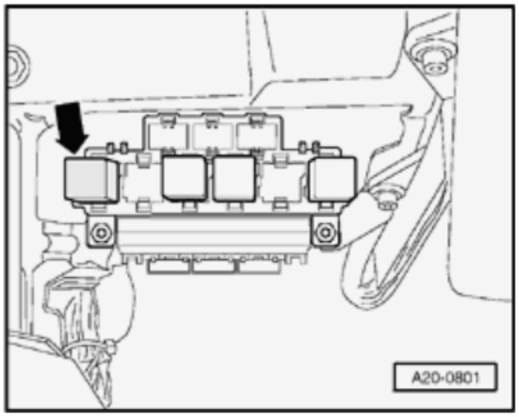

Fig. 81: Installed Location On 9-Socket Relay Carrier In Driver Footwell
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- on the 9-unit relay carrier in driver's footwell, left, position 1

Checking Fuel Pump (FP) Relay -J17-. Refer to **Fuel Pump (FP) relay -J17- and relay activation, checking**

Location of Brake Light Switch -F- and Brake Vacuum Vent Valve Switch -F47-, Clutch Vacuum Vent Valve Switch -F36-

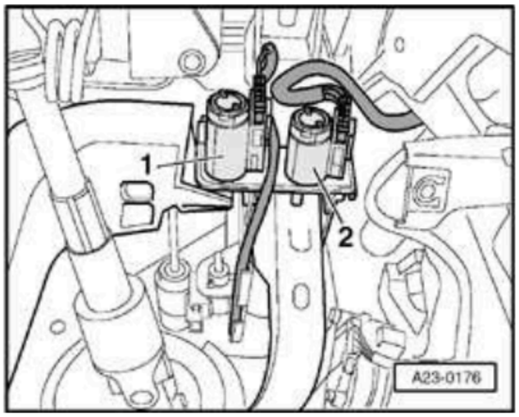

Fig. 82: Installed Location Brake Light Switch F And Brake Pedal Switch F47 , Clutch Pedal Switch F36
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Brake Light Switch -F-, Brake Vacuum Vent Valve Switch -F47-

2 - Clutch Vacuum Vent Valve Switch -F36-

Removing and installing switches

Refer to **46 - BRAKES - MECHANICAL COMPONENTS**

Refer to **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 012/01W FRONT WHEEL DRIVE

Refer to **30 CLUTCH** for 5 SPD. MANUAL TRANSMISSION 01A ALL WHEEL DRIVE

Refer to **30 CLUTCH** for 6 SPD. MANUAL TRANSMISSION 01E ALL WHEEL DRIVE

Location of Throttle Position (TP) Sensor 1 -G79- and Sender -2- for accelerator pedal position -G185-

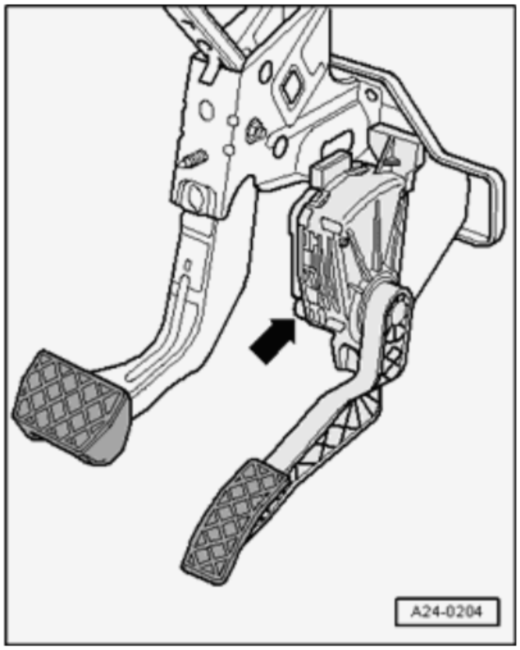

Fig. 83: Location Of Throttle Position (TP) Sensor 1 -G79- And Sender -2- For Accelerator Pedal Position -G185-
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Both the Throttle Position (TP) Sensor 1 -G79- and the Sender -2- for accelerator pedal position -G185- are stored in one housing.

Location of Engine Control Module (ECM) in electronics box (plenum chamber)

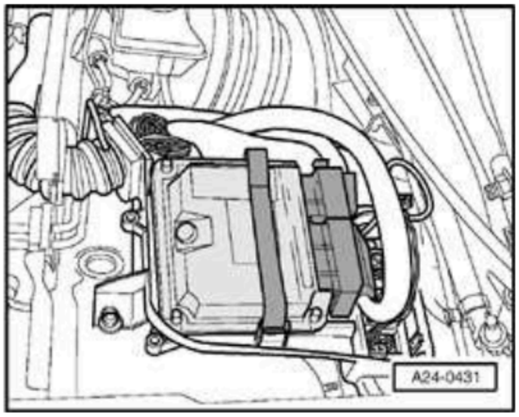

Fig. 84: Location Of Engine Control Module (ECM) In Electronics Box (Plenum Chamber)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Replacing Engine Control Module (ECM) (without metal anti-theft housing). Refer to **Engine Control Module (ECM) (without metal anti-theft housing), replacing**

Replacing Engine Control Module (ECM) (with metal anti-theft housing). Refer to **Engine Control Module (ECM) (with metal anti-theft housing), replacing**

Component locations in electronics box (plenum chamber)

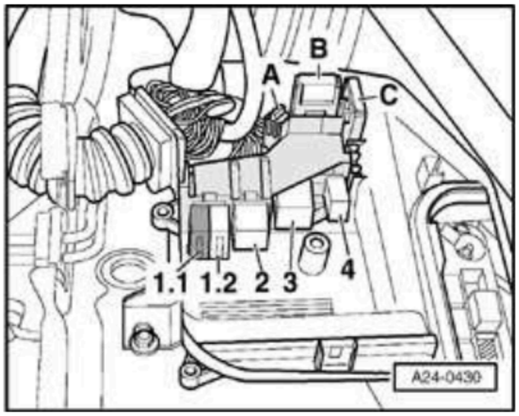

Fig. 85: Component Locations In Electronics Box (Plenum Chamber)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1.1 - Not used

1.2 - Not used

2 - Motronic Engine Control Module (ECM) Power Supply Relay -J271-

3 - Secondary Air Injection (AIR) Pump Relay -J299-

4 - Not used

A - Fuse S282 for engine electronics

B - Fuse S130 for secondary air pump

C - Not used

Location of Secondary Air Injection (AIR) Solenoid Valve -N112- and Recirculating valve for turbocharger -N249-

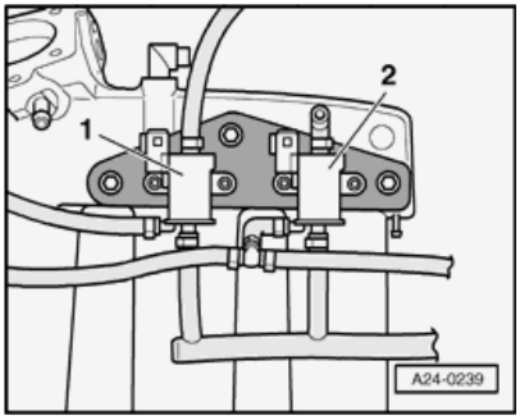

Fig. 86: Location Of Secondary Air Injection (Air) Solenoid Valve -N112- And Recirculating Valve For Turbocharger -N249-
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Location: underneath intake line

1 - Secondary Air Injection (AIR) Solenoid Valve -N112-

2 - Recirculating valve for turbocharger -N249-

NOTE: The illustration shows bottom view of intake line.

Location of Charge Air Pressure Sensor -G31-

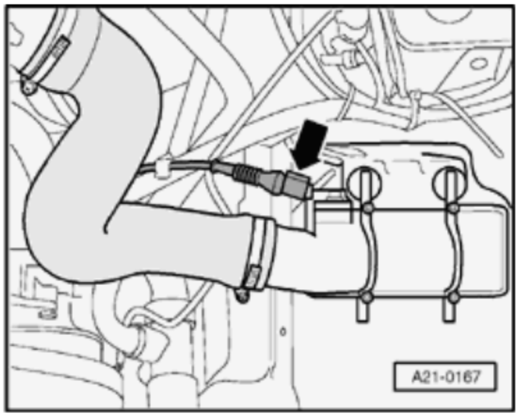

Fig. 87: Location Of Charge Air Pressure Sensor -G31-
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Charge Air Pressure Sensor -G31- (arrow) screwed into top of charge air cooler.

Electrical testing using VAG1598/31 test box

NOTE:
- **If the Engine Control Module (ECM) is equipped with a metal anti-theft housing (for theft prevention), the metal anti-theft housing must be**

removed from the ECM to connect the test box. Procedure. Refer to Engine Control Module (ECM) (with metal anti-theft housing), replacing. After repairs are complete, the metal anti-theft housing must be reinstalled.

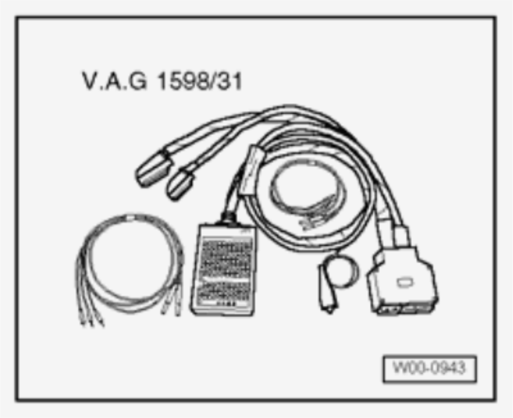

Fig. 88: V.A.G 1598/31 Test Box
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **The test box VAG 1598/31 is designed in such a way that it can be connected simultaneously to the Engine Control Module wiring harness and to the Engine Control Module itself.**
- **This has the advantage that the electronic engine control system remains fully functional when the test box is connected (for example, for measuring signals when the engine is running).**
- **Relevant test procedures note if Engine Control Module (ECM) should also be connected to the test box or not.**
- **Always use VAG1594A connector test kit to attach measurement devices (e.g. VAG1527B voltage tester, VAG1526 multimeter etc.).**

Work sequence

- Switch ignition off.
- Remove Engine Control Module (ECM). Refer to **Removing**.

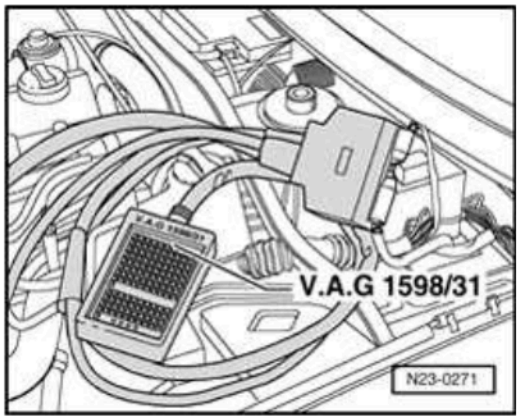

Fig. 89: VAG1598/31 Test Box Connected To Control Module Wiring Harness
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect VAG1598/31 test box to connector of wiring harness. Ground (GND) clip at test box must be clipped to battery Ground. Connect VAG 1598/31 test box to connectors of wiring harness.
- Relevant test procedures note if Engine Control Module (ECM) should also be connected to test box.
- Perform test as described in appropriate repair procedures.

NOTE: Important notes after re-connecting Engine Control Module (ECM):

- Check DTC memory and erase, if necessary. Refer to **Diagnostic Trouble Code (DTC) memory, checking** .
- Generate readiness code. Refer to **Readiness code, generating**.

Procedure after interruption of voltage supply

NOTE: After reconnecting the voltage supply the following operations must be performed:

- Check DTC memory and erase, if necessary. Refer to **Diagnostic Trouble Code (DTC) memory, checking** .
- Generate readiness code if the DTC memory has been erased. Refer to **Readiness code, generating**.

Engine Control Module (ECM) (without metal anti-theft housing), replacing

Removing ECMs with metal anti-theft housing. Refer to **Engine Control Module (ECM) (with metal anti-theft housing), replacing**.

NOTE: When the Engine Control Module is disconnected, the learned values are erased but the contents of the DTC memory remain intact.

Removing Engine Control Module

- Connect vehicle diagnostic, testing and information system VAS 5051 and select control module for engine electronics using "Address word" 01.

For this purpose, the ignition must be switched on.

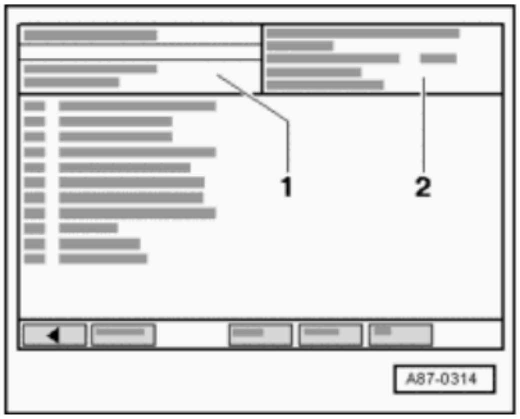

Fig. 90: Locating Control Module Identification With Code Indicated On The Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The control module identification and the coding -2- is shown on the display of the VAS 5051 tester.

- Always start by displaying and printing out control module identification.
- Switch ignition off.

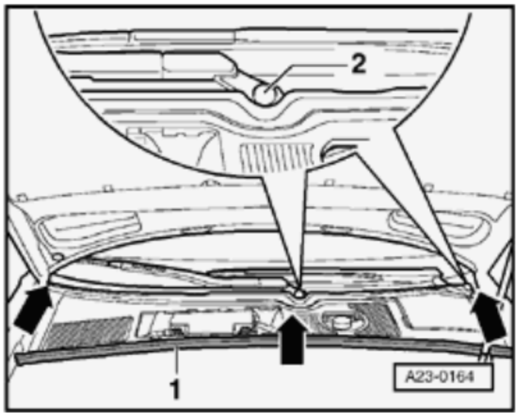

Fig. 91: Removing Rubber Seal From Plenum Chamber Cover Toward Front & Both Wiper Blade Arms
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rubber seal -1- from plenum chamber cover toward front.
- Take out plenum chamber cover.
- Remove both wiper blade arms -2- (mark position).
- Unclip trim (arrows).

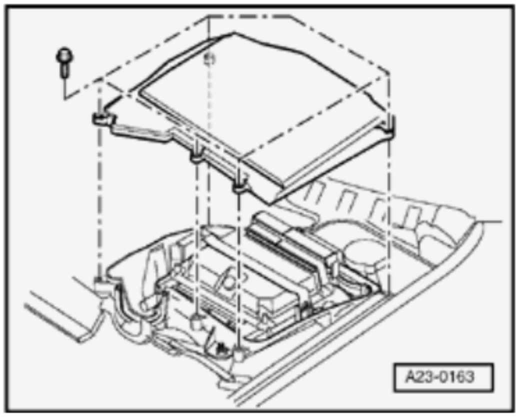

Fig. 92: Removing Protective Housing For Control Modules
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove protective housing for control modules.

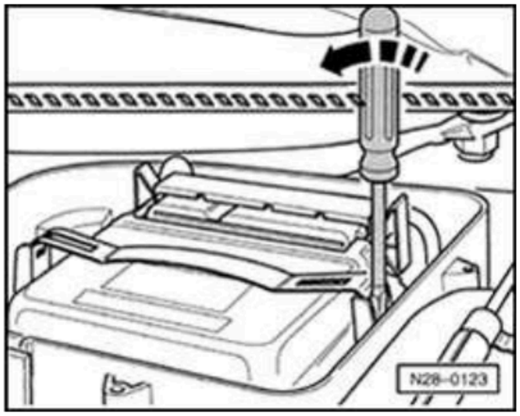

Fig. 93: Prying Off Retainer Bar With Screwdriver
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pry off retainer bar with a screwdriver (arrow).

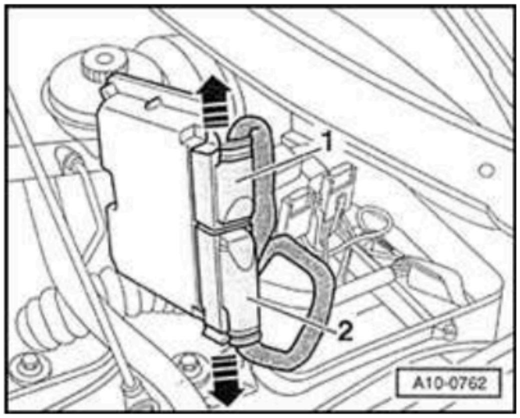

Fig. 94: Releasing Connector Fixings And Disconnecting Control Module Connectors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release connector fixings (arrows) and disconnect control module connectors -1- and -2-.
- Remove old Engine Control Module and install new Engine Control Module.

Installing Engine Control Module

Installation is performed in the reverse sequence.

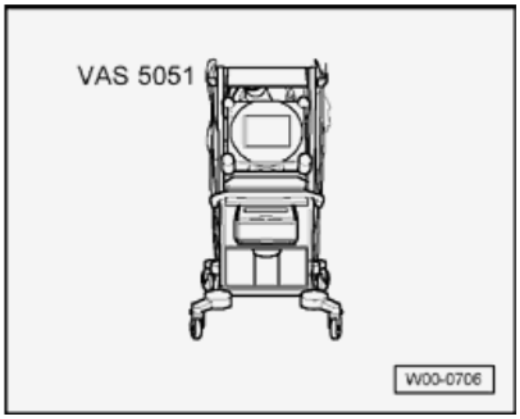

Fig. 95: Identifying Vehicle Diagnosis, Testing And Information System VAS 5051
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The following operations must be performed after installing the Engine Control Module:

- Perform encoding of new Engine Control Module.
- Adapt Immobilizer to Engine Control Module
- Perform adaptation of Throttle Valve Control Module -J338-.
- Perform adaptation of the exhaust gas recirculation valve.
- In vehicles with cruise control system (recognizable by the steering column switch) this must be activated in the Engine Control Module.
- Check DTC memory and erase, if necessary.

The sequence is described in:

Refer to VAS 5051 vehicle diagnostic, testing and information system

Engine Control Module (ECM) (with metal anti-theft housing), replacing

Removing ECMs without metal anti-theft housing. Refer to **Engine Control Module (ECM) (without metal anti-theft housing), replacing**.

Removing

- Connect VAS5051 tester and select vehicle system "01 - Engine Electronics". Ignition must be switched on for this.

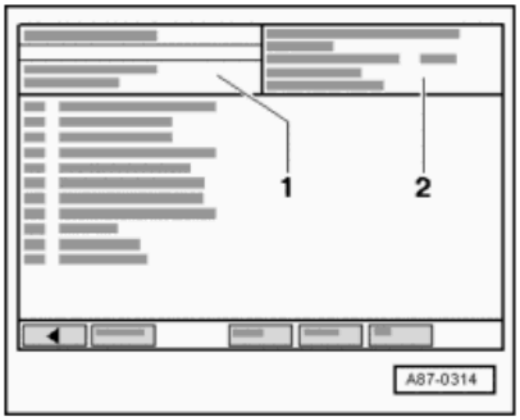

Fig. 96: Locating Control Module Identification With Code Indicated On The Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

VAS5051 tester display will indicate the control module identification and coding -2-.

- Always allow display of control module identification first and print it out.
- Switch ignition off.

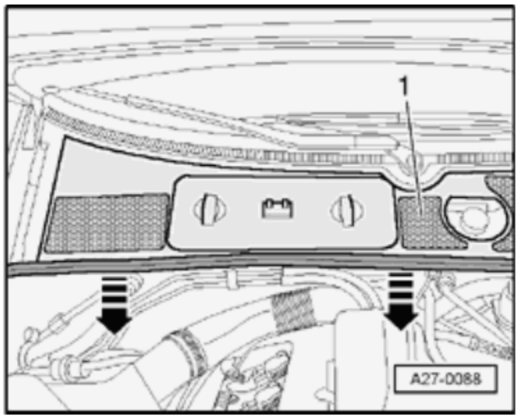

Fig. 97: Identifying Plenum Chamber Cover & Removing Rubber Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull off plenum chamber cover rubber seal in direction of arrow.
- Remove cover -1- toward front.

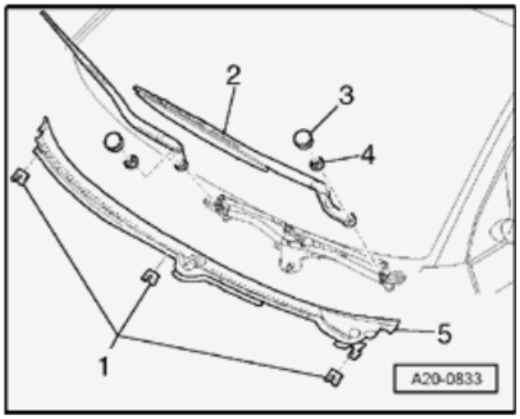

Fig. 98: Removing Securing Clips And Cowl
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry off both covers -3- using a screwdriver.
- Loosen hex-nuts -4- several turns.
- Loosen wiper arm -2- by lightly tilting from wiper axle.
- Remove hex nuts completely and remove wiper arms.

- Disconnect securing clips -1- and remove cowl grill -5-.

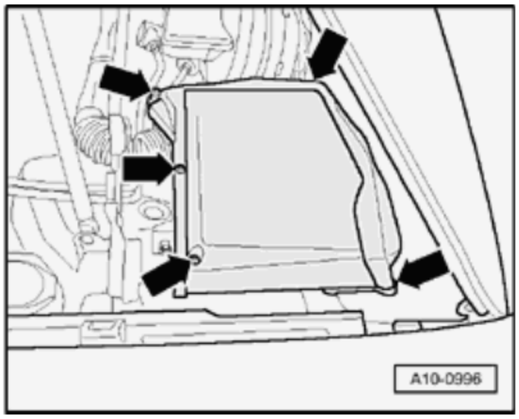

Fig. 99: Removing Screws And Cover From E-Box In Plenum Chamber
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover for E-box, plenum chamber (arrows).

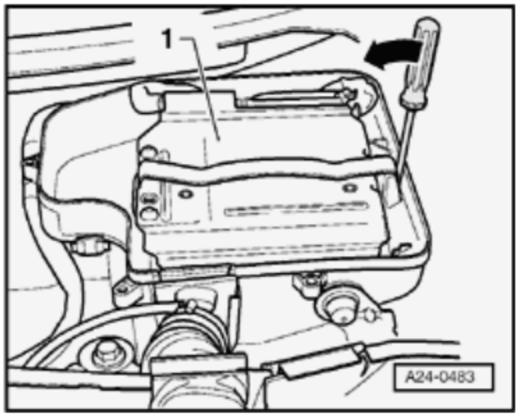

Fig. 100: Using Screwdriver To Pry Off Retaining Bracket
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a screwdriver, carefully pry off retaining bracket (arrow).

NOTE: **Item -1- in illustration shows Engine Control Module (ECM) with anti-theft housing.**

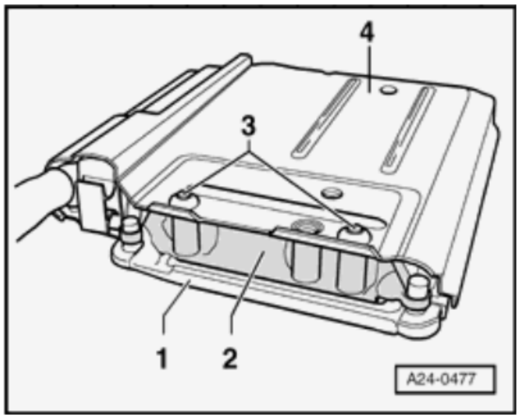

Fig. 101: ECM, Locking Mechanism, Screws And Anti-Theft Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

To restrict accessibility (for theft prevention) to the harness connectors and the Engine Control Module (ECM), the ECM -1- is screwed to a metal anti-theft housing -4- via a locking mechanism -2- and snap-off screws -3-.

The threads of the snap-off screws are coated with a locking compound to make it more difficult to remove the snap-off screws.

To disconnect the harness connectors from the Engine Control Module (ECM) (e.g. when connecting a test box or when replacing the ECM), the ECM must be removed from the metal anti-theft housing. This procedure is described as follows.

The following equipment is required:

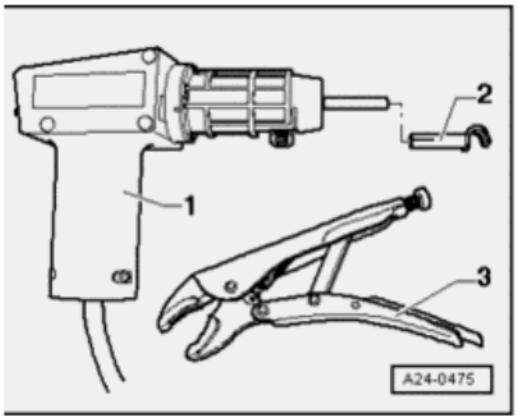

Fig. 102: Heat Gun, Adapter Nozzle And Pliers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Heat gun -1- (from VAS1978 Wiring Harness Repair Kit)
- Adapter nozzle -2- (also from VAS1978 Wiring Harness Repair Kit)
- Standard locking pliers

Work sequence

CAUTION: The following work steps must be adhered to exactly to avoid damage (burning) of wires, harness connectors, insulation and control modules! Observe operating instructions of heat gun.

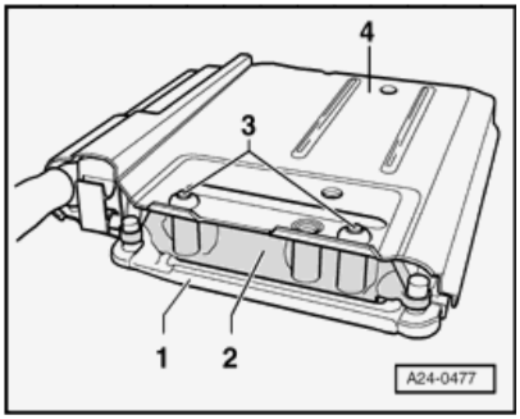

Fig. 103: ECM, Locking Mechanism, Screws And Anti-Theft Housing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- "Fold" Engine Control Module (ECM) with anti-theft housing in direction of engine compartment so that locking mechanism (item -2- in illustration) becomes visible and place a clean rag below Engine Control Module (ECM) with anti-theft housing.

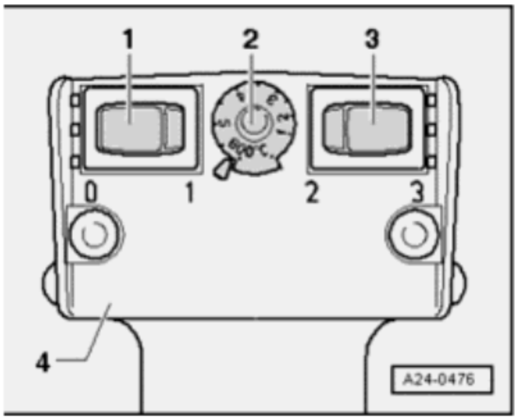

Fig. 104: Performing Adjustments On Hot Air Gun
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Adjust heat gun as shown in illustration, i.e. temperature adjustment -2- to maximum heat output and two-stage switch for air mass -3- to position 3.

NOTE: **Next, use a heat gun to heat the threads of the locking mechanism into which the snap-off screws are screwed into. This step loosens the locking compound on the threads of the snap-off screws for easier removal.**

WARNING: **By heating the locking mechanism threads, the snap-off screws and parts of the metal anti-theft housing will also become very hot. Be careful not to get burned! If possible, also make sure that only the threads and no other parts in the vicinity become heated. If necessary, cover them.**

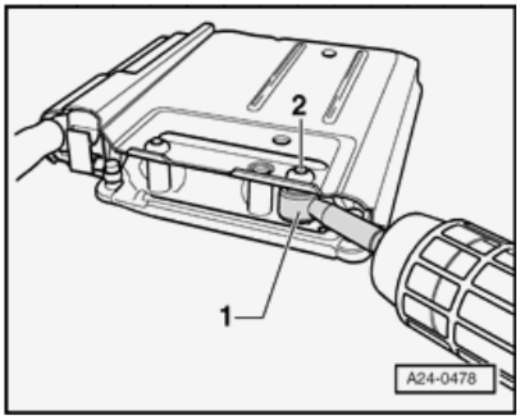

Fig. 105: Nozzle Of Heat Gun Guided To Locking Mechanism Threads So That Nozzle "Encloses" Threads
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Guide nozzle -1- of heat gun to locking mechanism threads so that nozzle "encloses" threads. It is OK to let nozzle make contact at upper end of metal anti-theft housing.
- Switch on heat gun and heat up threads for approx. 20 to 25 seconds.

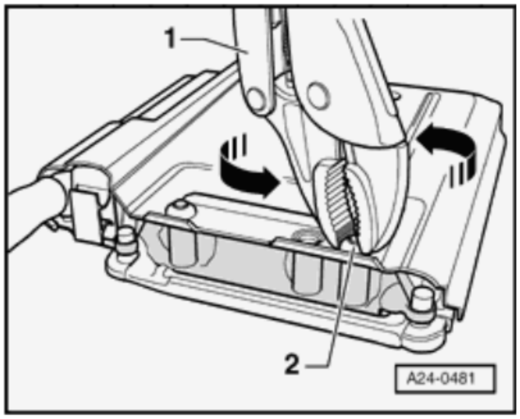

Fig. 106: Grabbing Screw Head And Removing Snap-Off Screw Using Locking Pliers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Next, using locking pliers -1-, grab screw head -2- and remove snap-off screw by turning in direction of arrow.

Procedure for the second snap-off screw is exactly the same. Be very careful since the control module connector is in close proximity.

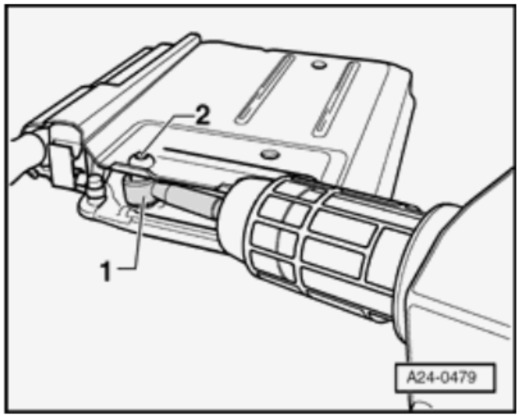

Fig. 107: Nozzle Of Heat Gun Guided To Locking Mechanism Threads Again So That Nozzle "Encloses" Threads
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Guide nozzle -1- of heat gun to locking mechanism threads again so that nozzle "encloses" threads. It is OK to let nozzle make contact at upper end of metal anti-theft housing.
- Switch on heat gun and heat up threads for approx. 20 to 25 seconds.

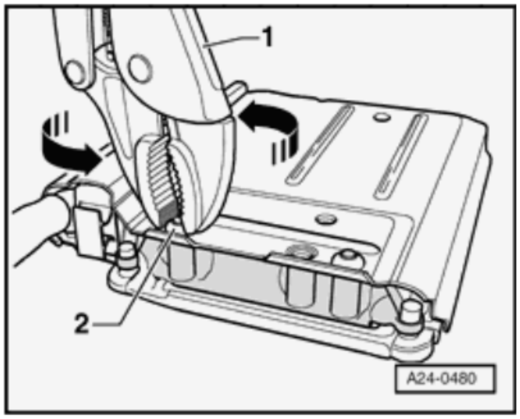

Fig. 108: Grabbing Screw Head And Removing Snap-Off Screw Using Locking Pliers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Next, using locking pliers -1-, grab screw head -2- and remove snap-off screw by turning in direction of arrow.

The Engine Control Module (ECM) can now be removed from the metal anti-theft housing.

- Disengage connectors from Engine Control Module (ECM) and disconnect connectors.
- Remove old Engine Control Module (ECM) and insert new one.

Installing Engine Control Module (ECM)

Installation is reverse of removal, noting the following:

After repairs are complete, the metal anti-theft housing must be reinstalled. Use new snap-off screws.

After connecting a new Engine Control Module (ECM), the following work steps must be performed:

- Activate Engine Control Module (ECM) in "Guided Troubleshooting" below subject heading "Engine Control Module (ECM), replacing".

Use VAS5051 tester to do so.

Idle speed (RPM), checking

Special tools and workshop equipment required

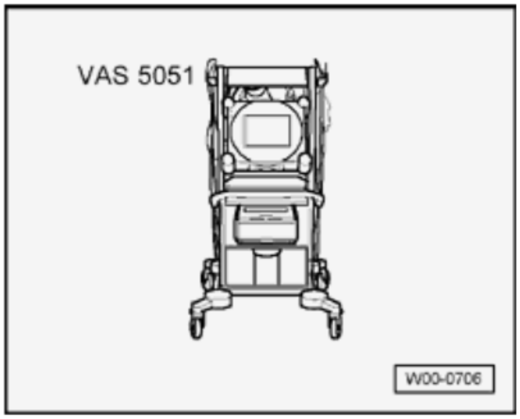

Fig. 109: Identifying Vehicle Diagnosis, Testing And Information System VAS 5051
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAS 5051 Vehicle diagnostic, testing and information system
- VAS 5051/1 adapter

Requirements

- No leaks in exhaust system
- Coolant temperature at least 80 ° C.
- Electrical devices switched off (coolant fan must not run during the test).
- Air conditioning switched off.

- Pressure gauge not connected.
- Vehicles with automatic transmission: Selector lever in position P or N.

NOTE:

- **The idle speed (RPM) cannot be adjusted.**
- **The idle speed (RPM) is tested during the basic setting of the engine.**
- **During basic setting, the Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- is closed and the air conditioning compressor is switched off.**

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection. Engine must be running at idle.
- Check DTC memory. Refer to **Diagnostic Trouble Code (DTC) memory, checking** . There must not be any DTCs stored. If necessary, repair any DTCs and erase DTC memory. After erasing DTC memory, generate readiness code. Refer to **Readiness code, generating**.
- Leave engine idling.

CAUTION: The electric coolant fan should not be running.

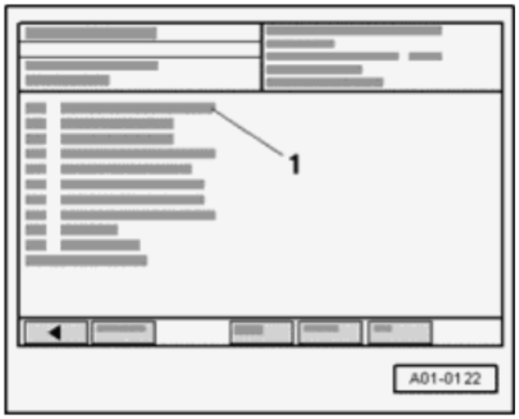

Fig. 110: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "04 - Basic setting".

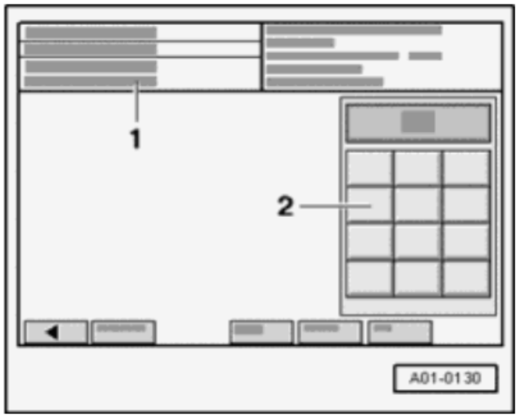

Fig. 111: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "056" for "display group number 056" in zone -2- and confirm entry by pressing -Q- button.

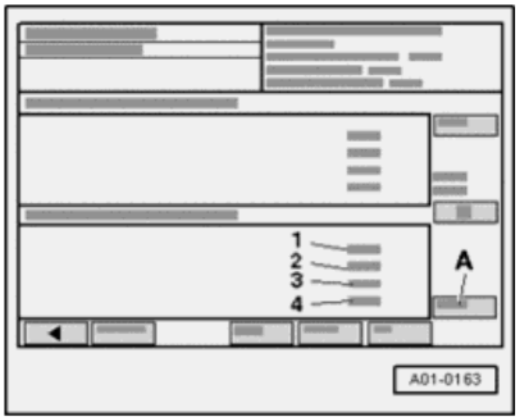

Fig. 112: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Check whether engine speed (RPM) in display zone -1- (actual speed) is within permitted tolerance range.

	Display zones			
	1	2	3	4
Display group 056: Idling speed stabilization at operating temperature				
Display	**xxx rpm**	**xxx rpm**	x.x %	X X X X X
Display	**Engine speed (actual)**	**Engine speed (specified)**	Air mass of idling speed controller	Operating conditions
Specified value	**700..860 rpm**	**760 rpm**	x.x %	0 0 0 0 0
If the specification is not obtained. Refer to **Idle speed (RPM), checking**			Relevance of figures. Refer to **Idle speed (RPM), checking**	

NOTE:

- **The engine speed (RPM) in display zone 1 (actual speed) is the actual engine speed.**
- **The engine speed (RPM) in display zone 2 (specified speed) is a theoretical value calculated by the engine control module.**
- **At idle, the ECM always tries to adapt the actual engine speed (RPM) to the desired (specified) engine speed (RPM).**
- **This means that the actual engine speed (RPM) must always approximately match the specified engine speed (RPM) at idle.**
- **The display zones 3 and 4 are there for information but are irrelevant to the control of the engine at idle.**

- Exit function "04 - Basic setting" by pressing <-- button.

If specified value is not obtained:

- Check DTC memory again. Refer to **Diagnostic Trouble Code (DTC) memory, checking** .
- If DTC memory has been erased, generate readiness code. Refer to **Readiness code, generating**.

If the idle is too high or too low and there are no DTCs recorded in the DTC memory, perform the following tests:

- Check intake air system for unmetered air. Refer to **Intake air system for leaks (unmetered air), checking**.
- Check Throttle Valve Control Module -J338-. Refer to **Throttle Valve Control Module -J338-, checking**.
- Check to see if Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- is continuously held open. Refer to **Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, checking**.
- Perform adaptation of Throttle Valve Control Module -J338-. Refer to **Throttle Valve Control Module -J338-, adapting**.

Significance of 5 digit indication of display group 056

x	x	x	x	x	Display field 4
0					Display always 0
	0				Rear window defroster: 0 = rear window defroster off; 1 = rear window defroster on
		0			Climate control readiness: 0 = maximum heating/cooling power off, 1 = maximum heating/cooling power on
			0		Manual transmission: display always 0 Driving mode for automatic transmission: 0 = selector lever in P or N; 1 = selector lever in

					R/D/S
				0	A/C compressor: 0 = A/C compressor off; 1 = A/C compressor on

System pressure, fuel pressure regulator and residual pressure, checking

NOTE:

- **The fuel pressure regulator is located in the fuel filter underneath the tank.**
- **Fuel pressure regulator regulates fuel pressure according to intake manifold pressure. This ensures that the pressure drop at the fuel injectors remains the same for each speed and load range of the engine.**

Special tools and workshop equipment required

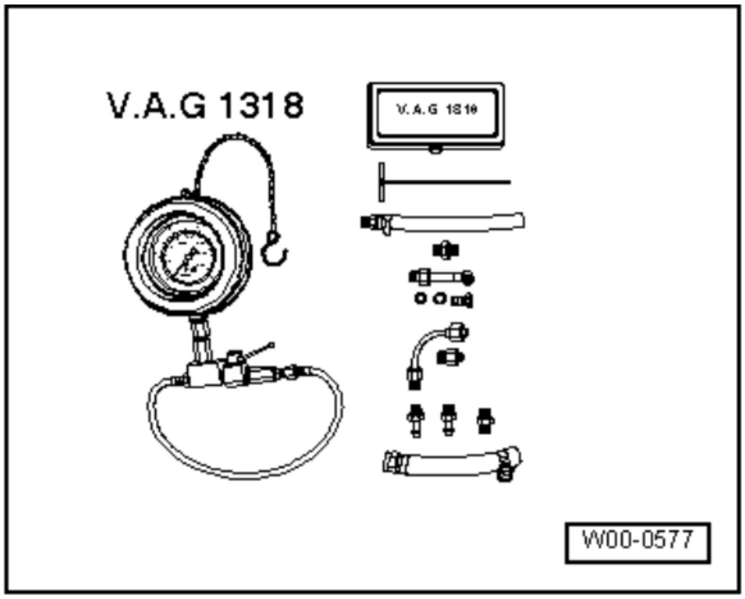

Fig. 113: Identifying Pressure Gauge V.A.G 1318
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- V.A.G 1318 Pressure gauge
- V.A.G 1318/6 Adapter
- V.A.G 1318/7 Adapter

Requirements

- Fuel pump relay OK.
- Fuel pump OK; checking:

Refer to **20 - FUEL SUPPLY SYSTEM**

- Fuel filter OK
- Battery voltage at least 12.7 V
- Vehicles with automatic transmission: Selector lever in position P or N.

Checking system pressure

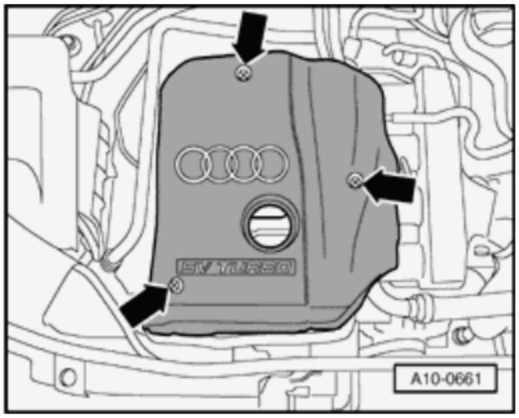

Fig. 114: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover (arrows).
- Open fuel filler flap and briefly open the fuel tank filler cap (to release pressure).
- Remove engine cover.

Vehicles up to 06.03

WARNING: **The fuel system is pressurized! Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.**

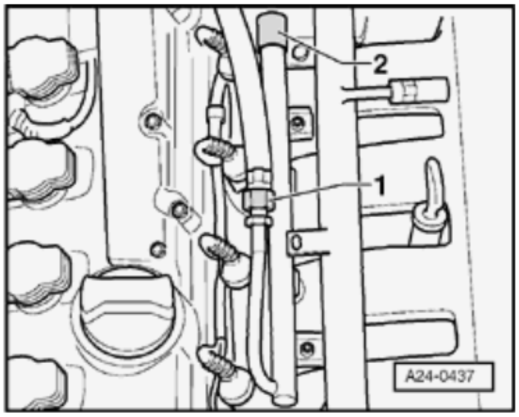

Fig. 115: Identifying Union Nut For Fuel Supply Line

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect fuel supply line -1- and expose.

NOTE: Disregard item no. -2-.

Vehicles as of 07.03

WARNING: Fuel system is under pressure! Before opening system, place rags around the connection point. Then release pressure by carefully loosening connection.

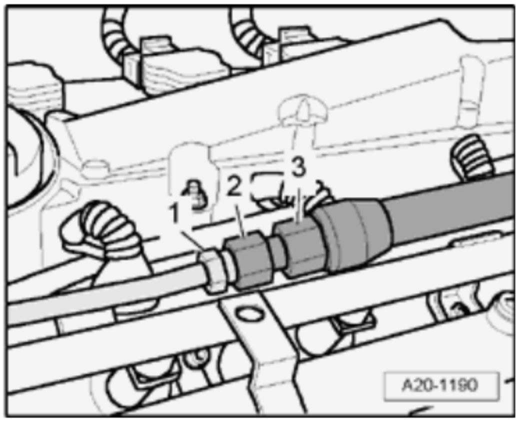

Fig. 116: Counterholding Using An Open-End Wrench At Each Hex Head & Unscrew Union Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew fuel hose from connection on fuel rail pipe. To do so, counterhold using an open-end wrench at each hex head -1- and -3- and unscrew union nut -2-.

Continuation for all vehicles

- Connect pressure gauge V.A.G 1318 using adapters 1318/6 and 1318/7 to feed line.

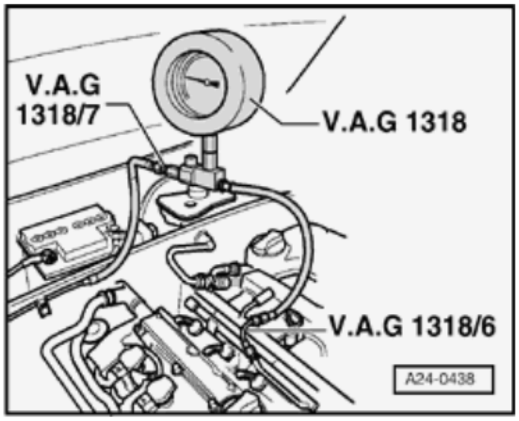

Fig. 117: Opening Shut-Off Valve Of Pressure Gauge

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Open shut-off valve of pressure gauge. Lever points in direction of flow.
- Start engine and run at idle.
- Measure fuel pressure.

- Specified value: approx. 4.0 bar excess pressure

- Switch ignition off.
- Check leak tightness and holding pressure by watching gauge indicator fall.

- After 10 minutes the remaining pressure should be at least 2.5 bar excess pressure

If the holding pressure drops below 2.5 bar:

- Start engine and run at idle.

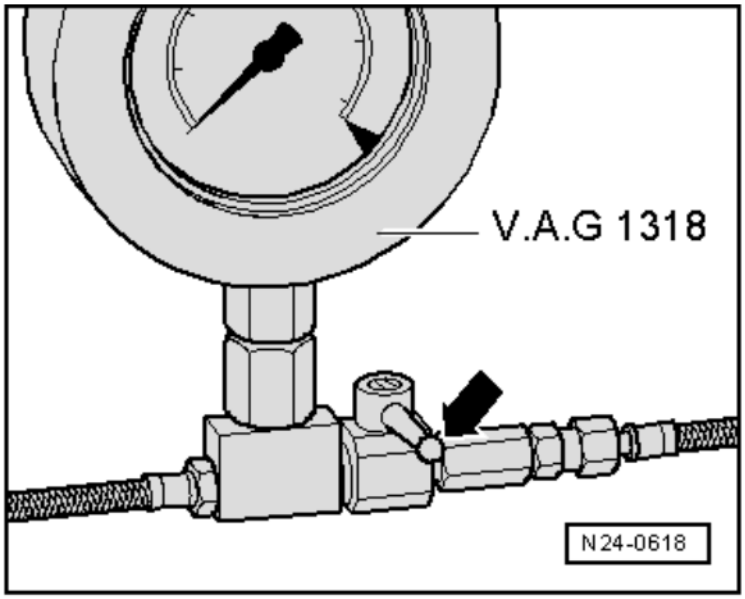

Fig. 118: Locating V.A.G 1318 Shut-Off Tap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Allow pressure to build up, then switch off ignition. At same time close shut-off valve on pressure gauge V.A.G 1318 (valve lever at right angles to direction of flow -arrow-).
- Observe pressure drop on gauge.

If the pressure drops again:

- Check pressure gauge for leaks.
- Check line connections, O-rings on fuel rail and injectors for leaks.

If the pressure does not drop:

- Check pressure regulator in fuel filter.

Checking fuel pressure regulator - vehicles with front wheel drive

- Remove trim in luggage compartment.
- If necessary fold right backrest of rear seatbench forward.

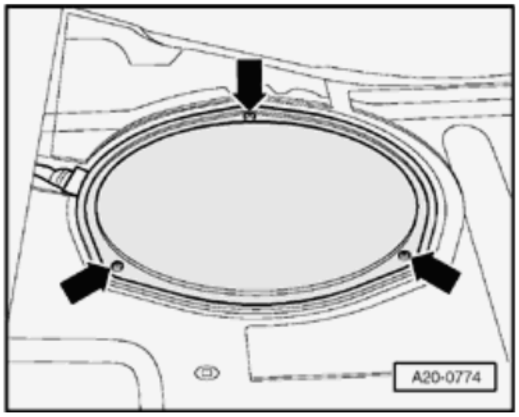

Fig. 119: Unbolting Cover For Sealing Flange
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew cover for sealing flange (arrow).

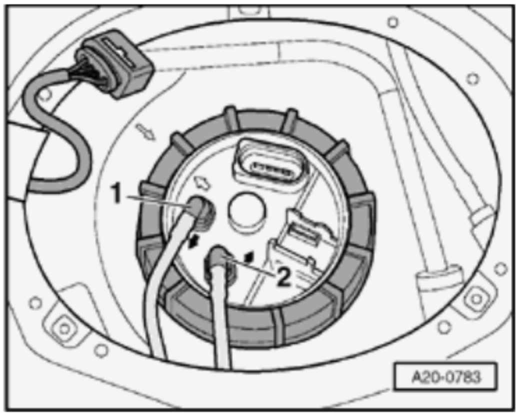

Fig. 120: Identifying Fuel Return Line & Fuel Return Line
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect fuel return line -2- from sealing flange.

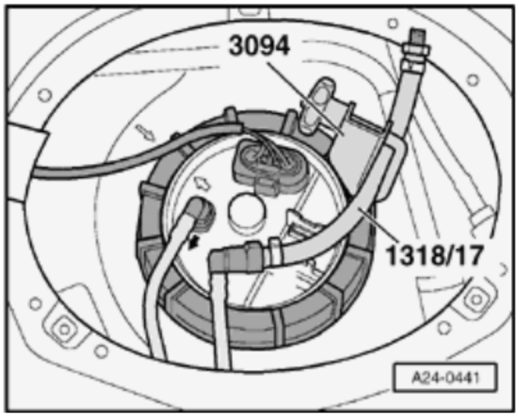

Fig. 121: Attaching Adapter Piece V.A.G 1318/17 -1 To Return Line & Disconnecting Adapter Piece Using Hose Clamp 3094
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach adapter piece V.A.G 1318/17 -1 to return line.
- Disconnect adapter piece using hose clamp 3094.

NOTE: **Do not attach hose clamp 3094 directly to fuel line. Danger of damage may occur.**

- Start engine and run at idling speed.

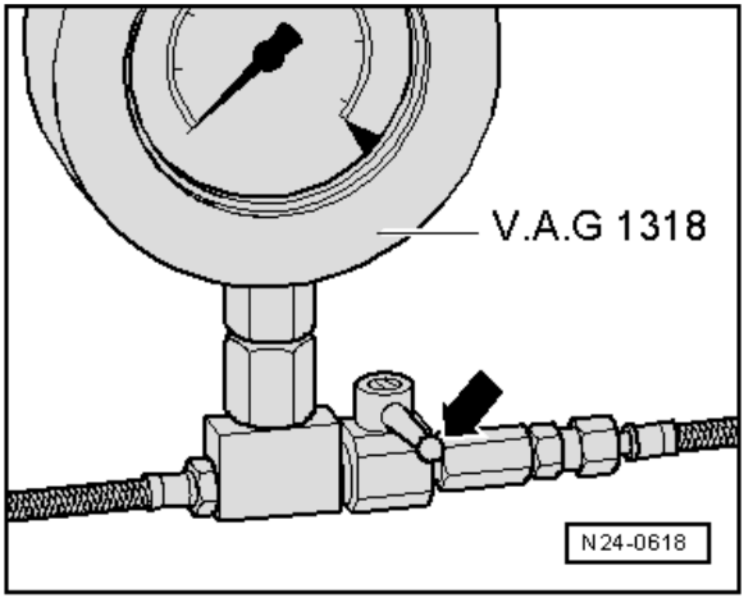

Fig. 122: Locating V.A.G 1318 Shut-Off Tap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Allow pressure to build up, then switch off ignition. At same time close cut off valve on pressure gauge V.A.G 1318 (valve lever at right angles to direction of flow -arrow-).
- Observe pressure drop on pressure gauge.

If the pressure drops again:

- Check fuel pump non return valve.

If the pressure now does not drop:

- Replace fuel filter.

Refer to **20 - FUEL SUPPLY SYSTEM**

NOTE:

- **Before removing the pressure gauge, release the fuel pressure by opening the cut off valve. When doing this hold a container over the connection.**
- **Assemble the fuel supply in reverse order.**

Vehicles up to 06.03

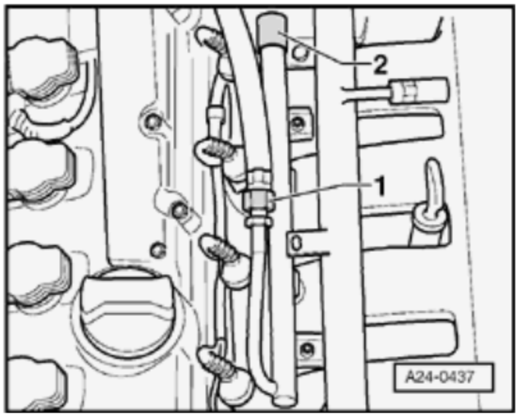

Fig. 123: Identifying Union Nut For Fuel Supply Line
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten union nut for fuel supply line -1- to 22 Nm.

Vehicles as of 07.03

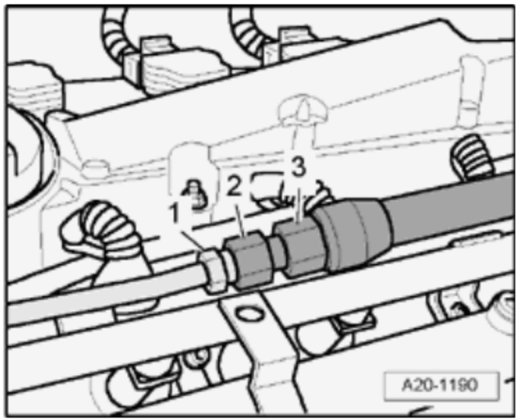

Fig. 124: Counterholding Using An Open-End Wrench At Each Hex Head & Unscrew Union Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure fuel hose to connection on fuel rail pipe. To do so, counterhold using an open-end wrench at each hex head -1- and -3- and tighten union nut -2- to 22 Nm.

Checking fuel pressure regulator - vehicles with all wheel drive

- Remove rear bench seat.

Refer to

- **72 - SEAT - FRAMES**
- **72 - SEAT - FRAMES** for BODY INTERIOR - CABRIOLET

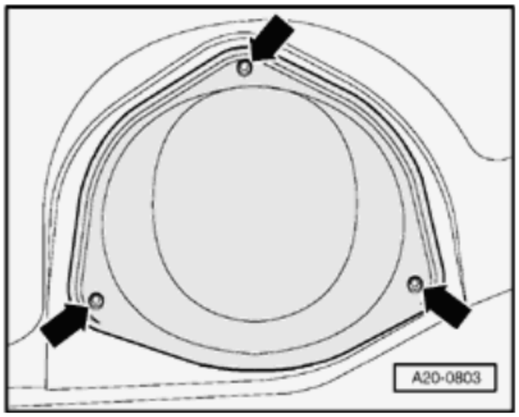

Fig. 125: Removing Cover Bolts For Locking Flange
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew cover for sealing flange from left (arrows).

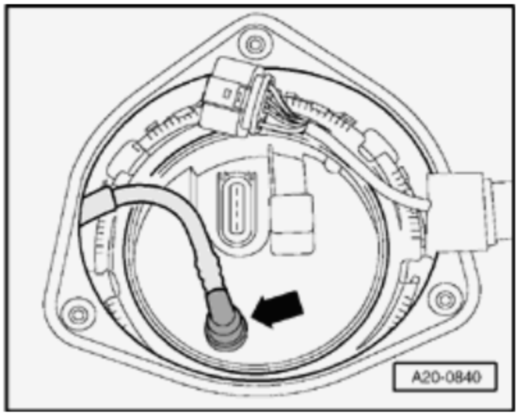

Fig. 126: Pulling Fuel Line Off From Left Locking Flange
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect fuel return line (arrow) from sealing flange (left side of vehicle).

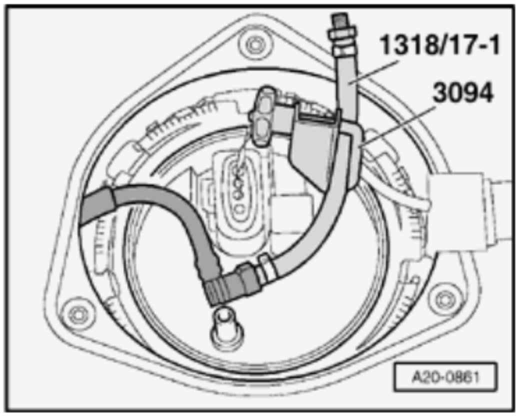

Fig. 127: Attaching Adapter Piece V.A.G 1318/17-1 To Return Line & Disconnecting Adapter Piece Using Hose Clamp 3094
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Attach adapter piece V.A.G 1318/17-1 to return line.
- Disconnect adapter piece using hose clamp 3094.

NOTE: Do not attach hose clamp 3094 directly to fuel line - Danger of damage

- Start engine and run at idling speed.

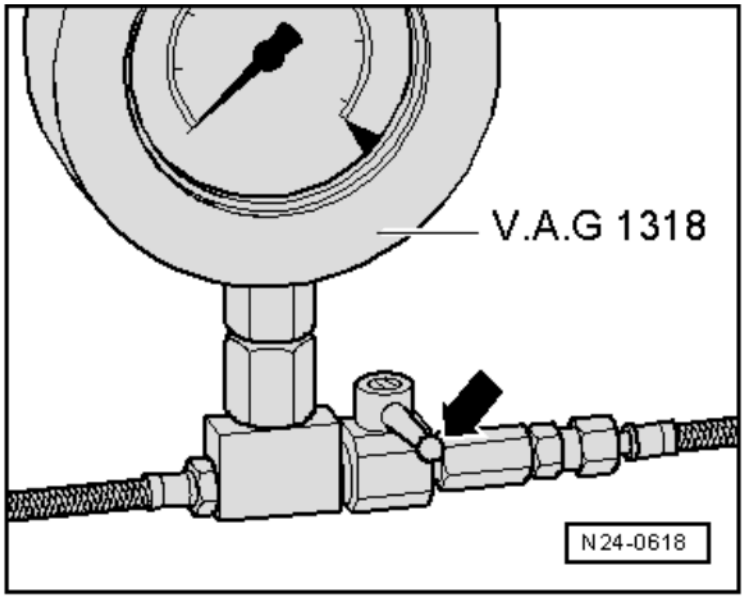

Fig. 128: Locating V.A.G 1318 Shut-Off Tap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Allow pressure to build up, then switch off ignition. At same time close cut off valve on pressure gauge V.A.G 1318 (valve lever at right angles to direction of flow -arrow-).

- Observe pressure drop on pressure gauge.

If the pressure drops again:

- Check fuel pump non return valve.

If the pressure now does not drop:

- Replace fuel filter.

Refer to **20 - FUEL SUPPLY SYSTEM**

Assembly is performed in the reverse order, note the following while doing so:

NOTE: Before removing the pressure gauge, release the fuel pressure by opening the cut off valve. When doing this hold a container over the connection.

Vehicles up to 06.03

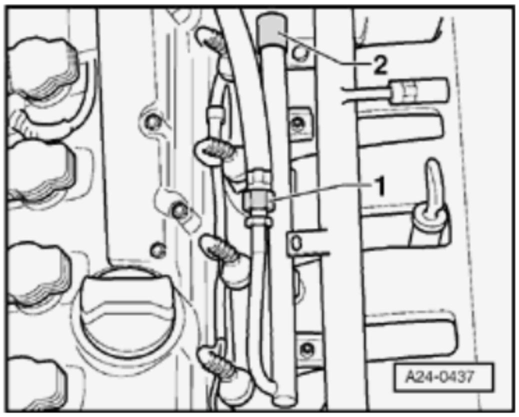

Fig. 129: Identifying Union Nut For Fuel Supply Line
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tighten union nut for fuel supply line -1- to 22 Nm.

Vehicles as of 07.03

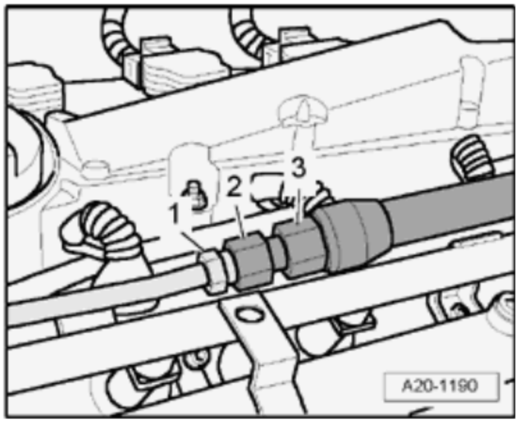

Fig. 130: Counterholding Using An Open-End Wrench At Each Hex Head & Unscrew Union Nut
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Secure fuel hose to connection on fuel rail pipe. To do so, counterhold using an open-end wrench at each hex head -1- and -3- and tighten union nut -2- to 22 Nm.

Fuel injectors, checking

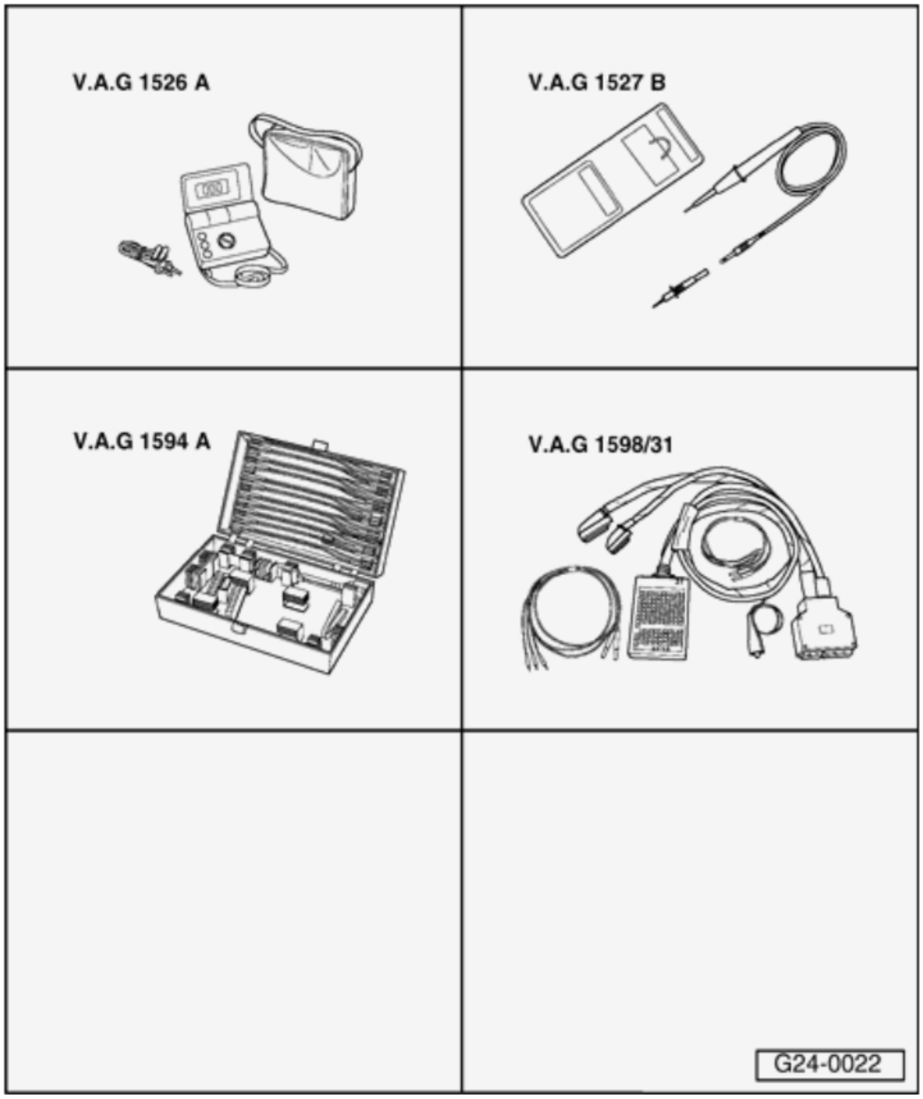

Fig. 131: Identifying Special Tools - Fuel Injectors, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1527 B LED voltage tester
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box

Work sequence

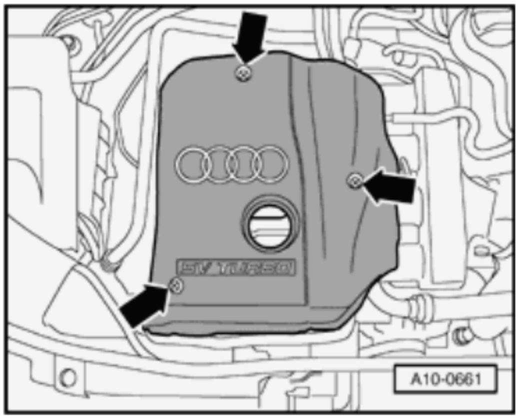

Fig. 132: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover (arrows).

Checking internal resistance

- Remove connector on fuel injector to be checked.

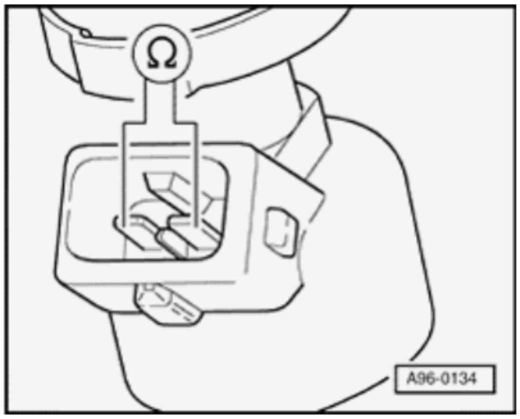

Fig. 133: Checking Resistance Of Fuel Injectors Between Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter to fuel injector to measure resistance.

- Specified value: 12 to 13 ohms (at room temperature)

If specified value is not obtained:

- Replace fuel injector.

If specified value is obtained:

Checking power supply

Requirements

- Fuse for injectors OK

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

- Fuel pump relay OK; checking. Refer to **Fuel Pump (FP) relay -J17- and relay activation, checking**.

NOTE: The fuel injectors receive their power supply via the fuel pump relay.

- ○ Remove connector on fuel injector to be checked.

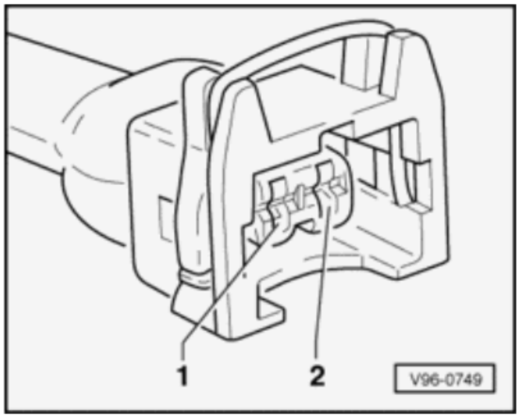

Fig. 134: Identifying 2-Pin Electrical Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- ○ Connect LED voltage tester V.A.G 1527 B as follows:

Connector Terminal	Measure to
1	Engine ground (GND)

- ○ Operate starter briefly.

- LED should light up.

If the LED does not light up:

- ○ Check wiring connection between terminal 1 and fuse for fuel injector for open circuit:

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

- ○ Repair any open circuit or wiring concerns.

If the LED lights up:

Checking activation

Requirements

- Internal resistance of the valve OK

- ○ Push back rubber grommet of connector on fuel injector but leave connector attached.

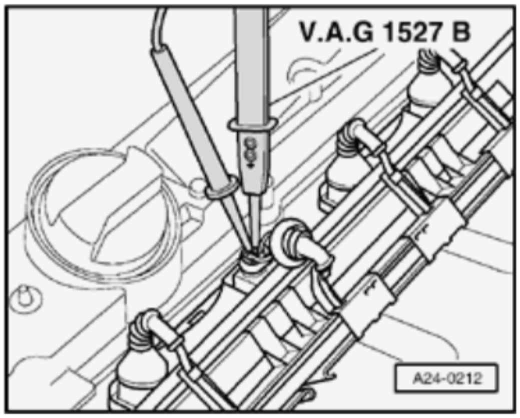

Fig. 135: Connecting LED Voltage Tester V.A.G 1527 B Between Terminals 2 (Signal) And 1 (B+)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- ○ Connect LED voltage tester V.A.G 1527 B between terminals 2 (signal) and 1 (B+).
- ○ Operate starter briefly.

- LED should flash.

NOTE: **Voltage testers with a low current draw continue to glow faintly between activation from the engine control module (rather than extinguishing completely) and become slightly brighter when activated.**

If LED does not flash:

- ○ Connect test box V.A.G 1598/31 to wiring harness for Engine Control Module (ECM); do not connect Engine Control Module (ECM). Refer to **Electrical testing using VAG1598/31 test box**.

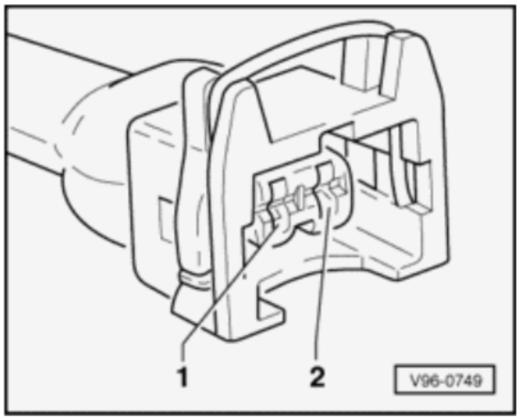

Fig. 136: Identifying 2-Pin Electrical Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check for open circuit, short to positive, or short to ground in following wiring connections:

Cylinder	Injector connector Terminal	Test box V.A.G 1598/31 Socket
1	2	96
2	2	89
3	2	97
4	2	88

- Repair any open/short circuit as necessary.

If the wiring is OK:

- Replace Engine Control Module (ECM). Refer to **Engine Control Module (ECM) (without metal anti-theft housing), replacing**.

Fuel rail with injectors, disassembling and assembling

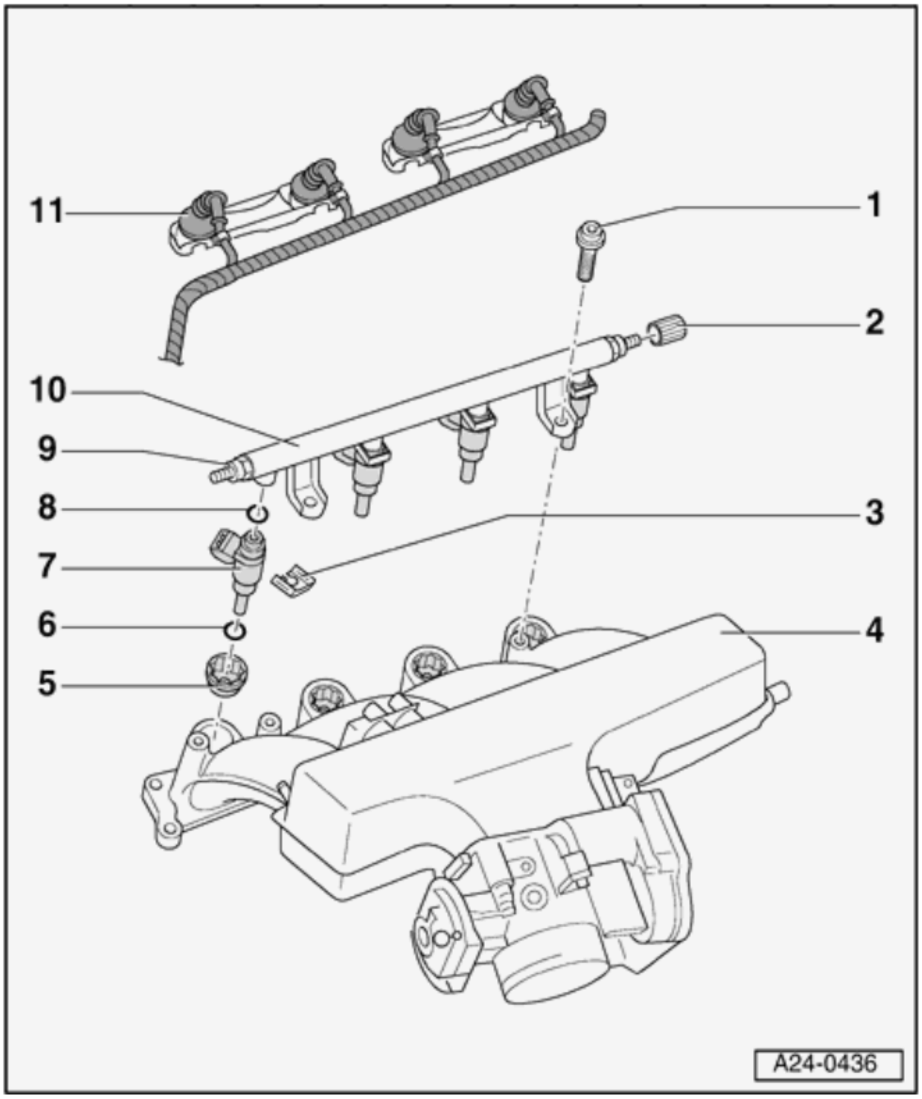

Fig. 137: Fuel Rail With Injectors, Disassembling And Assembling Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: To prevent damage to the catalytic converter, the fuel system must be bled after work is performed on fuel rail or on fuel lines. Refer to Fuel system, bleeding. Vehicle must only be started after bleeding.

1 - Hex head bolt - 10 Nm

2 - Protective cap

3 - Bracket

- Ensure it is positioned correctly on injector and fuel rail

4 - Intake manifold

- With Throttle Valve Control Module -J338-
- With Intake Air Temperature (IAT) Sensor -G42-
- **Removing:**

Refer to **15 - ENGINE - CYLINDER HEAD, VALVETRAIN** , Cylinder head, removing and installing

5 - Insert for injector - 3 Nm

- Install with locking fluid D 000 600 A2

6 - O-ring

- Removing and installing. Refer to **Fuel injectors, removing and installing**
- Replace
- Moisten with clean engine oil

7 - Fuel injectors

- Cylinder 1 -N30-
- Cylinder 2 -N31-
- Cylinder 3 -N32-
- Cylinder 4 -N33-

- Removing and installing. Refer to **Fuel injectors, removing and installing**

8 - O-ring

- Removing and installing. Refer to **Fuel injectors, removing and installing**
- Replace
- Moisten with clean engine oil

9 - Fuel supply line

- For vehicles up to 06.03, tighten union nut to 22 Nm
- Loosening and tightening union nut in vehicles as of 07.03. See **Loosening and tightening union nut for fuel supply line in vehicles as of 07.03**

> WARNING: **Fuel system is under pressure! Before opening system, place rags around the connection point. Then release pressure by carefully loosening connection.**

10 - Fuel rail

11 - Connector

- For injectors
- 4 pieces

Loosening and tightening union nut for fuel supply line in vehicles as of 07.03

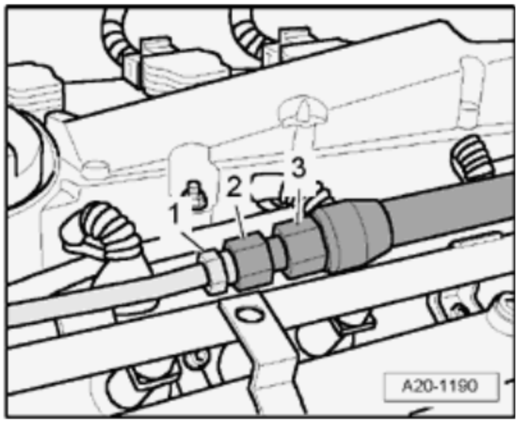

Fig. 138: Loosening And Tightening Union Nut For Fuel Supply Line In Vehicles As Of 07.03
Courtesy of VOLKSWAGEN UNITED STATES, INC.

WARNING: **Fuel system is under pressure! Before opening system, place rags around the connection point. Then release pressure by carefully loosening connection.**

Loosening

- Unscrew fuel hose from connection on fuel rail pipe. To do so, counterhold using an open-end wrench at each hex head -1- and -3- and unscrew union nut -2-.

Tightening

- Secure fuel hose to connection on fuel rail pipe. To do so, counterhold using an open-end wrench at each hex head -1- and -3- and tighten union nut -2- to 22 Nm.

Fuel injectors, removing and installing

Removing

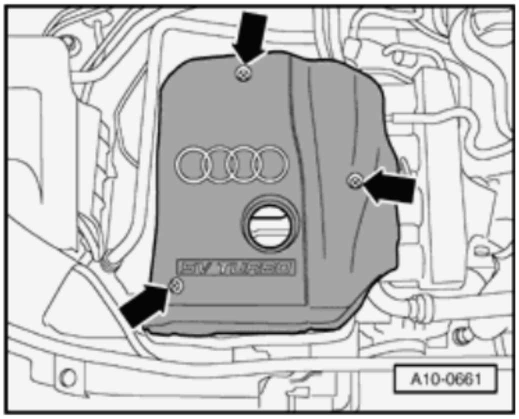

Fig. 139: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover (arrows).

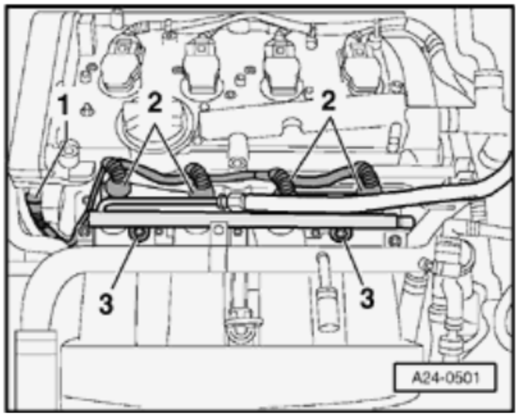

Fig. 140: Disconnecting Electrical Connectors To Camshaft Position (CMP) Sensor And To Fuel Injectors & Removing Retaining Bolts Of Fuel Rail
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connectors to Camshaft Position (CMP) Sensor -1- and to fuel injectors -2-.
- Remove retaining bolts -3- of fuel rail.
- Pull fuel distributor rail together with injectors off intake manifold and place it on a clean cloth at back of engine compartment.

WARNING: The fuel system is pressurized! Before opening the system place a cloth around the connection point. Then release pressure by carefully loosening the connection.

- Pull off retainer and disconnect injector.

NOTE: Replacement of fuel rail involves disconnecting fuel hoses.

Installing

Install in reverse order, paying attention to the following:

- Replace the O-rings at all opened connections. (when replacing the front O-ring, ensure that the plastic cap is not removed from the injector head. The O-ring must be pulled off over the plastic cap).
- Moisten the O-rings with clean engine oil.
- Make sure that the injectors are installed in the correct positions.
- Check to make sure that the retainer clamps are properly seated.

- Position fuel rail with secured injectors on intake manifold and press evenly into place.

Tightening torque

Component	Nm
Fuel distributor rail to intake manifold	10

Injection quantity, proper seal and spray pattern of fuel injectors, checking

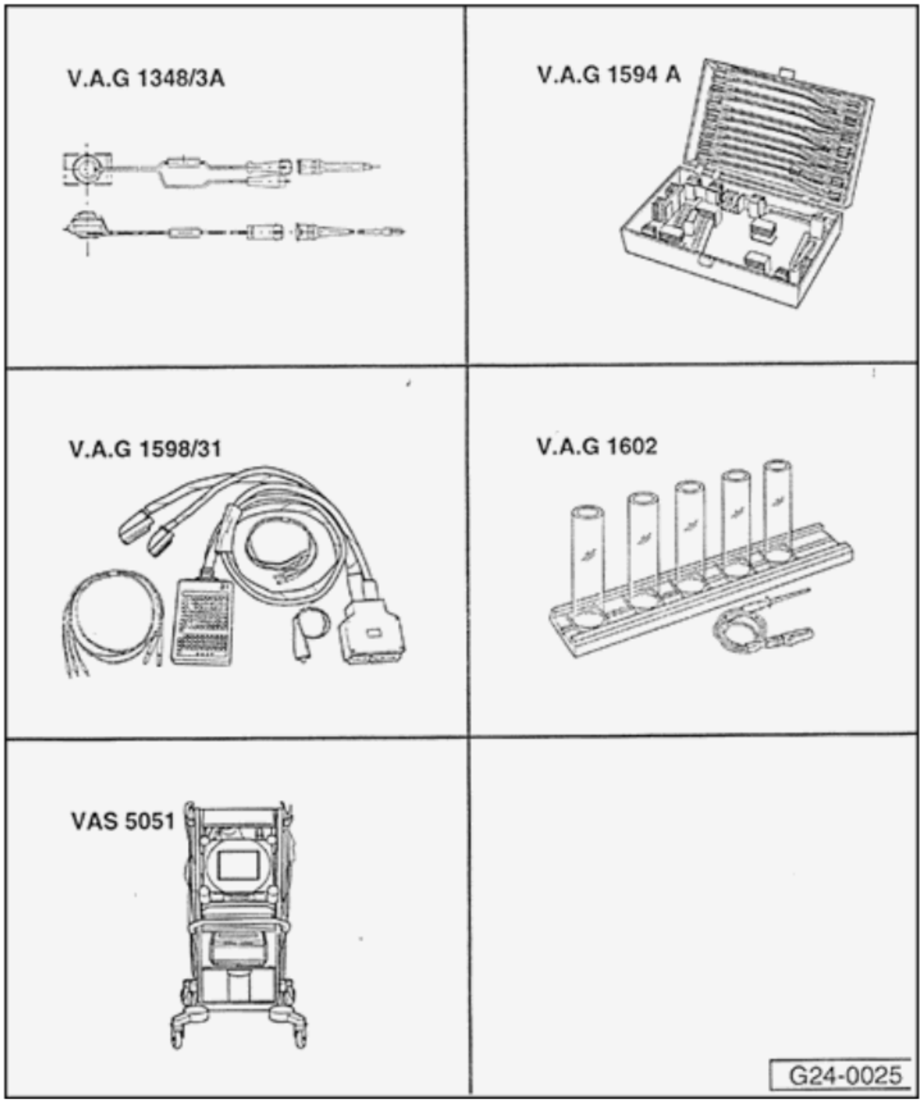

Fig. 141: Identifying Special Tools - Injection Quantity, Proper Seal And Spray Pattern Of Fuel Injectors, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1348/3A Remote control
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box
- V.A.G 1602 Injection quantity tester

- VAS 5051 Vehicle diagnostic, testing and information system
- VAS 5051/1 Adapter

Requirements

- Fuel pressure OK, checking. Refer to **System pressure, fuel pressure regulator and residual pressure, checking**.

Work sequence

- Remove fuel rail including injectors installed from intake manifold. Refer to **Fuel injectors, removing and installing**. Fuel hoses remain connected.
- Connect VAG1598/31 test box at wiring harness to ECM, do not connect to ECM. Refer to **Electrical testing using VAG1598/31 test box**.

Leak test

- Jumper terminals 1 and 65 at test box using adapter cables from VAG1594A connector test kit (this step supplies Ground (GND) to one side of relay coil for Fuel Pump (FP) relay).
- Switch ignition on.

NOTE: **After switching ignition on, Fuel Pump (FP) will run continuously, even with engine not running. This is true because: Fuel Pump (FP) relay is supplied with B+ via central electrics after ignition is switched on. Fuel Pump (FP) relay receives ground (GND) via the jumper in test box.**

- Fuel pump must run.

- Check proper seal of fuel injectors visually. With Fuel Pump (FP) running, only 1-2 drops per minute may drip out per injector.
- If fuel loss is greater, stop Fuel Pump (FP) from running (switch off ignition) and replace faulty fuel injector. Refer to **Fuel injectors, removing and installing**

Checking injection quantity

- Insert fuel injector to be tested in a measuring glass from VAG 1602 injection quantity test device.

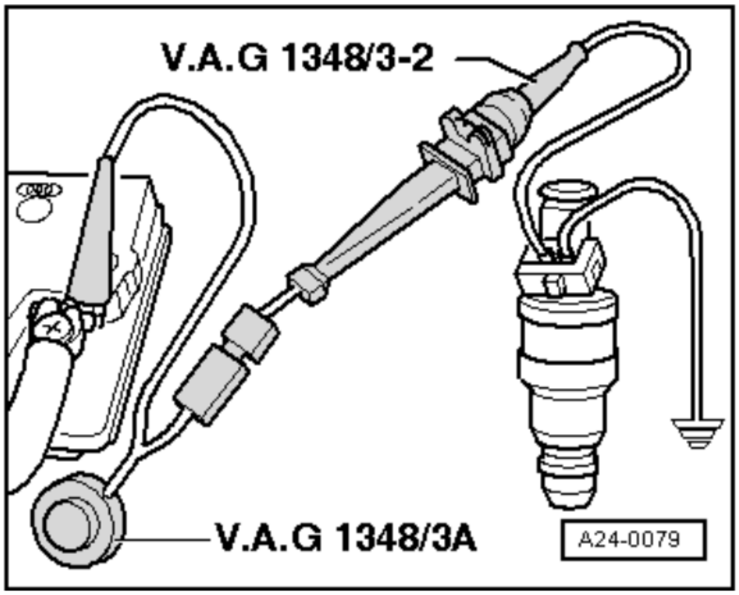

Fig. 142: Checking Fuel Injector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect one terminal of fuel injector to engine Ground (GND) using an adapter cable and an alligator clip from VAG 1594 A connector test kit.
- Connect second terminal of fuel injector to B+ using VAG 1348/3A remote control, VAG 1348/3-2 adapter cable and assisting cable.
- Jumper terminals 1 and 65 at test box with leads from adapter set VAG 1594 A.
- Switch ignition on.

- Fuel pump must run.

- Activate VAG 1348/3A remote control for 30 seconds.
- Perform measurements on all fuel injectors.
- After all four fuel injectors have been activated, place measuring glasses on an even surface.

- Specification per injector: 135 ± 10 ml.

- If measured value of one or more fuel injectors is outside of specified range, switch Fuel Pump (FP) off (switch ignition off) and replace faulty fuel injector. Refer to **Fuel injectors, removing and installing**.
- If measured values for all fuel injectors are outside specified range, check fuel pressure. Refer to **System pressure, fuel pressure regulator and residual pressure, checking**.

NOTE: Also check spray pattern when checking injection quantity. Spray pattern must be the same for all injectors.

- Reinstall fuel injectors together with fuel rail. Refer to **Installing**.

Fuel Pump (FP) relay -J17- and relay activation, checking

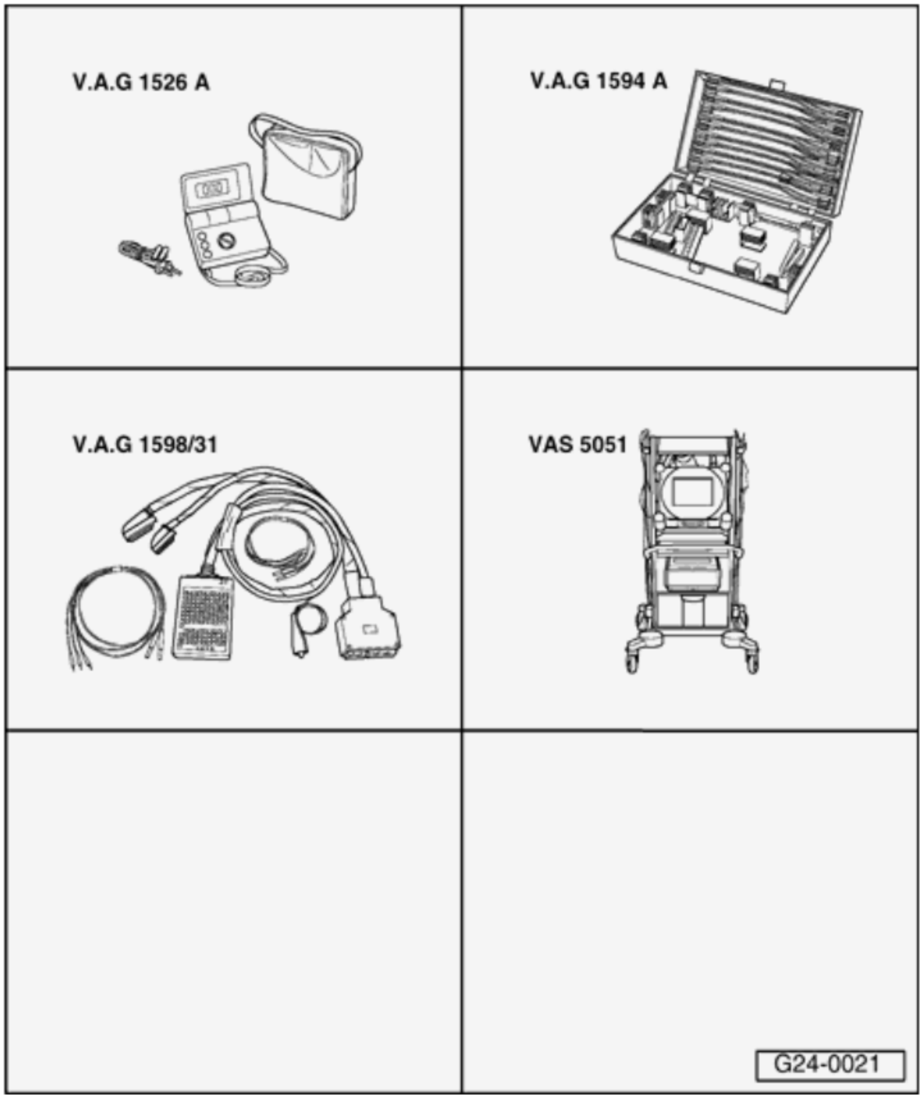

Fig. 143: Identifying Special Tools - Fuel Pump (FP) Relay -J17- And Relay Activation, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test Box
- VAS 5051 Vehicle diagnostic, testing and information system
- VAS 5051/1 Adapter

The fuel pump and certain components of the injection system are supplied with power by way of the Fuel Pump (FP) Relay -J17-.

The Fuel Pump (FP) Relay -J17- is only energized when the engine is running, i.e. the relay is only connected to ground (via the Engine Control Module) when engine speed pulses are detected in the Engine Control Module.

NOTE:

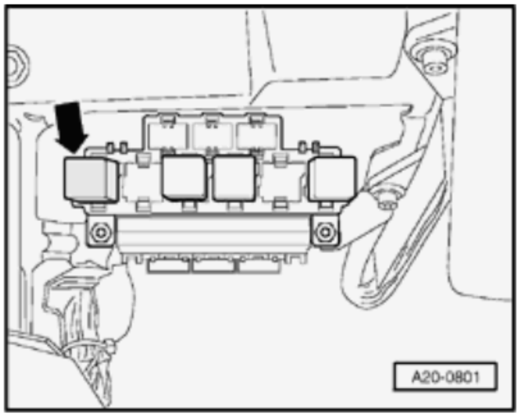

Fig. 144: Installed Location On 9-Socket Relay Carrier In Driver Footwell
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The fuel pump relay is located on the 9-unit- relay carrier on the left in the driver's footwell, position 1.

Requirements

- Battery voltage at least 12.7 V

Functional check of Fuel Pump (FP) Relay -J17-

- Remove driver's storage compartment:

Refer to

- **68 - INTERIOR EQUIPMENT**
- **68 - INTERIOR EQUIPMENT** for BODY INTERIOR - CABRIOLET

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection. Ignition must be switched on.
- Initiate Output Diagnostic Test Mode (DTM). Refer to **Output Diagnostic Test Mode (DTM)** and activate ACF solenoid valve -N80-.

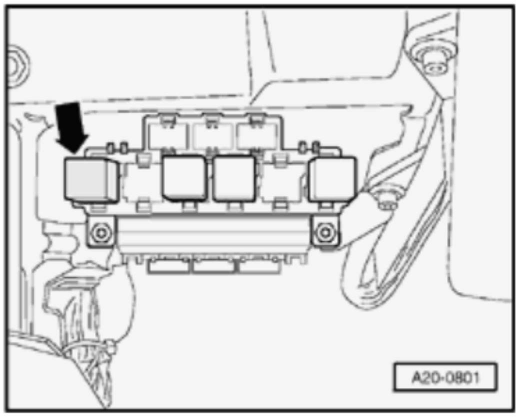

Fig. 145: Installed Location On 9-Socket Relay Carrier In Driver Footwell
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fuel pump relay (on the 9-unit-relay carrier in the driver's footwell on the left, position 1) should pull and fuel pump should run.

A - If relay does not respond:

- Check voltage supply of Fuel Pump (FP) Relay -J17-. Refer to **Checking voltage supply of Fuel Pump (FP) Relay -J17-**.
- Check activation of Fuel Pump (FP) Relay -J17-. Refer to **Checking activation of Fuel Pump (FP) Relay -J17-**.

B - If relay is energized but fuel pump does not run:

- Check voltage supply for fuel pump and components (via Fuel Pump (FP) Relay -J17-). Refer to **Checking voltage supply of fuel pump and components**.

Checking voltage supply of Fuel Pump (FP) Relay -J17-

- Disconnect Fuel Pump (FP) Relay -J17-.

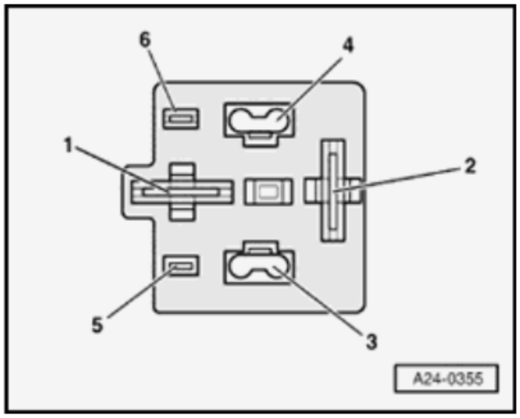

Fig. 146: Identifying Connector & 6 Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter as follows to measure voltage.

9-unit relay carrier in driver's footwell on left, position 1 Terminal	Measure to
1	Vehicle body ground (GND)

- Specified value: approx. battery voltage

- Connect multimeter as follows to measure voltage:

9-unit relay carrier in driver's footwell on left, position 1 Terminal	Measure to
3	Vehicle body ground (GND)

- Switch ignition on.

- Specified value: approx. battery voltage (B+)

If specified values are not obtained:

- Check wiring connections.

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

If specifications are obtained:

Checking activation of Fuel Pump (FP) Relay -J17-

- Switch ignition off.
- Re-insert relay.
- Connect test box V.A.G 1598/31 to wiring harness for engine control module; do not connect to engine control module (ECM). Refer to **Electrical testing using VAG1598/31 test box**.
- Switch ignition on.

- Jumper terminals 1 and 65 at test box with leads from adapter set V.A.G 1594A.

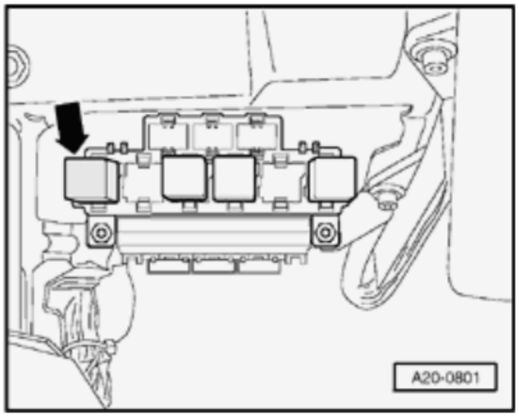

Fig. 147: Installed Location On 9-Socket Relay Carrier In Driver Footwell
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fuel Pump (FP) Relay -J17- (on the 9-unit-relay carrier in the driver's footwell on the left, position 1) should pull fuel and fuel pump should run.

If the relay responds now, but not during Output Diagnostic Test Mode (DTM):

- Replace Engine Control Module (ECM). Refer to **Engine Control Module (ECM) (without metal anti-theft housing), replacing**.

If the relay does not respond:

- Switch ignition off.
- Disconnect cable link.
- Disconnect Fuel Pump (FP) Relay -J17-.

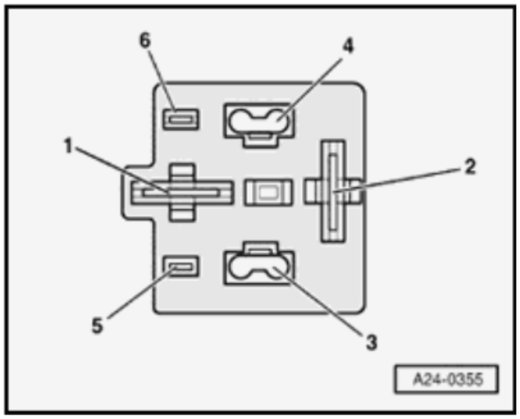

Fig. 148: Identifying Connector & 6 Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check for open circuit, short to positive, or short to ground (GND) in following wiring connection:

9-unit relay carrier in driver's footwell on left,	Test box V.A.G 1598/31

position 1 Terminal	Socket
5	65

- Repair any open/short circuit as necessary.

If no malfunction is found:

- Replace Fuel Pump (FP) Relay -J17-.
- Reconnect ECM.

Checking voltage supply of fuel pump and components

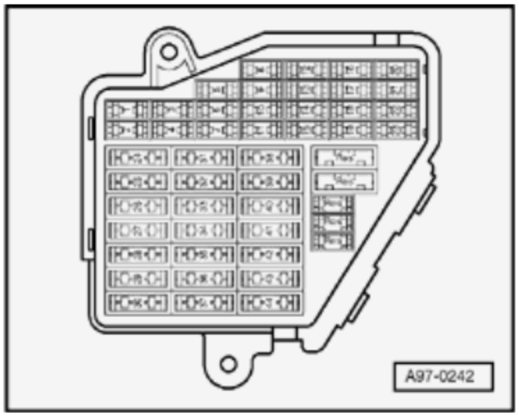

Fig. 149: Identifying Main Fuse Panel
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect fuses S228, S229 and S234 (positions 28, 32 and 34) in fuse holder.
- Initiate Output Diagnostic Test Mode (DTM). Refer to **Output Diagnostic Test Mode (DTM)** and activate EVAP Canister Purge Regulator Valve -N80-.
- To measure voltage, connect multimeter to ground (GND) and to one terminal of following fuses in fuse holder.

Fuse	Specified value at one of the terminals
S228	approx. battery voltage (B+)
S232	approx. battery voltage (B+)
S234	approx. battery voltage (B+)

If specified values are not obtained:

- Repeat test at other terminal of fuse base.

If specified values are still not obtained:

- Check wiring connections.

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

If no malfunction is found:

- Replace Fuel Pump (FP) Relay -J17-.
- Reinstall fuses.

Mass Air Flow (MAF) sensor -G70-, checking

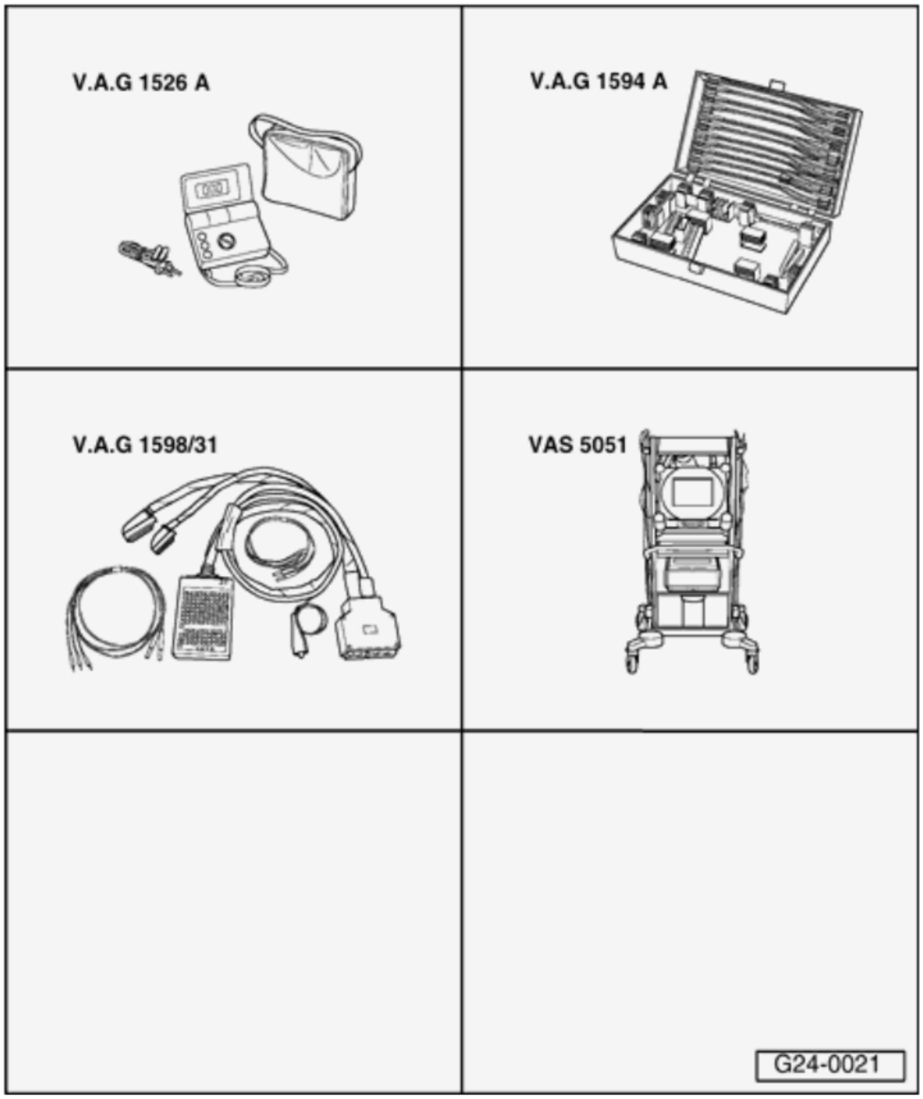

Fig. 150: Identifying Special Tools - Mass Air Flow (MAF) Sensor -G70-, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test Box
- VAS 5051 Vehicle diagnostic, testing and information system
- VAS 5051/1 Adapter

Component location. Refer to **Fig. 79**

Requirements

- Coolant temperature at least 80 ° C.
- Electrical consumers switched off (coolant fan must not run during the test).
- Air conditioning switched off.

Checking function

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection. Engine must be run at idle speed.

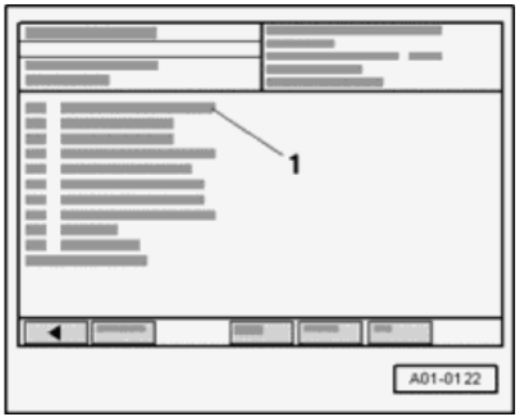

Fig. 151: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "04 - Basic setting".

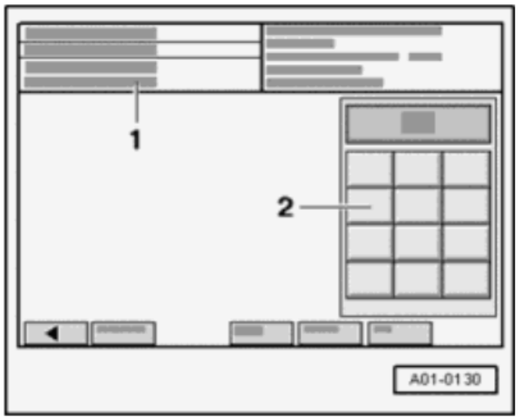

Fig. 152: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "002" for "display group number 002" in zone -2- and confirm entry by pressing -Q- button.

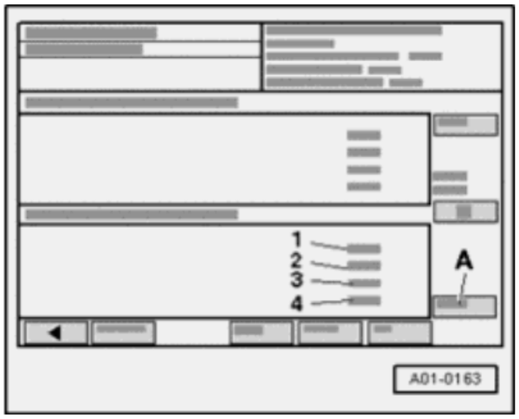

Fig. 153: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Check indication in display fields -3- and -4-.

	Display zones			
	1	2	3	4
Display group 002: Mass air flow at idle and operating temperature				
Display	xxx rpm	xxx %	**xx.x ms**	**xxx.x g/s**
Display	Engine speed	Load	**Average injection**	**Air mass**

			period	
Specified value	700..860 rpm	13...45%	**1.0..0.4.0 ms**	**2.0...4.5 g/s**
	---	---	If specified value is not obtained: Evaluation. Refer to **Evaluation of display group 002**	

- ○ Exit function "04 - Basic setting" by pressing <-- button.

Evaluation of display group 002

Display zone: 3	**Possible cause**	**Corrective action**
Less than 1.0 ms	• Lower values can only occur when vehicle is on overrun	
Greater than 4.0 ms	• Engine load from ancillaries	○ Eliminate load (air conditioning system/power steering/Generator)
	• Poor idling (not running on all cylinders)	○ Test spark plugs ○ Check injectors. Refer to **Fuel injectors, checking**
	• Throttle Valve Control Module -J338- faulty	○ Check Throttle Valve Control Module -J338-. Refer to **Throttle Valve Control Module -J338-, checking**
Display zone: 4	**Possible cause**	**Corrective action**
Less than 2.0 g/s	• Large quantity of unmetered air between intake manifold and Mass Air Flow (MAF) sensor • Voltage supply to MAF sensor or wiring to engine control module	○ Test for leaks (unmetered air) in intake air system. Refer to **Intake air system for leaks (unmetered air), checking** ○ Check voltage supply and/or wiring. Refer to **Voltage supply to Mass Air Flow (MAF) sensor -G70-, testing**
Greater than 4.5 g/s	• Engine load from ancillaries	○ Eliminate load (air conditioning system/power steering/Generator)
	• Voltage supply to Mass Air Flow (MAF) sensor or wiring to ECM	○ Check voltage supply and/or wiring. Refer to **Voltage supply to Mass Air Flow (MAF) sensor -G70-, testing**

Voltage supply to Mass Air Flow (MAF) sensor -G70-, testing

Requirements

- Fuse for Mass Air Flow (MAF) sensor OK.

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

- Fuel pump relay OK; checking. Refer to **Fuel Pump (FP) relay -J17- and relay activation, checking**.

NOTE: Voltage supply to Mass Air Flow (MAF) sensor is from Fuel Pump (FP) Relay -J17-.

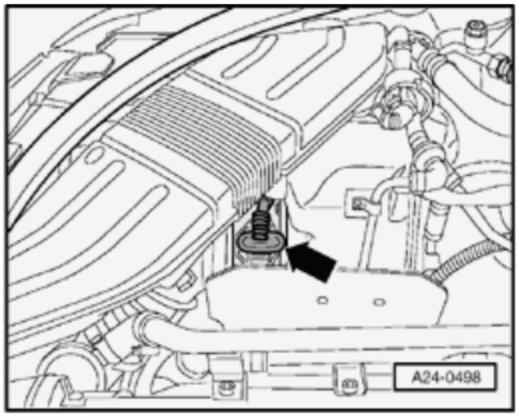

Fig. 154: Disconnecting Connector To Mass Air Flow (MAF) Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connector (arrow) to Mass Air Flow (MAF) sensor

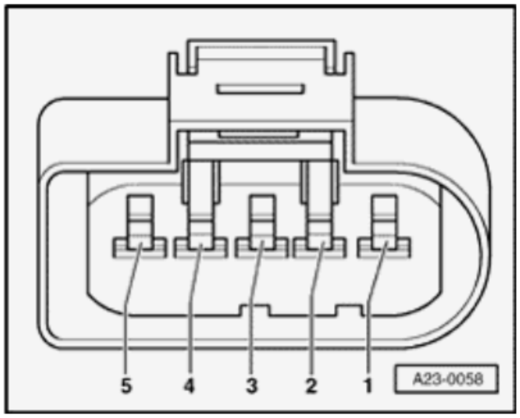

Fig. 155: Identifying 5-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter as follows to measure voltage.

Connector Terminal	Measure to
2	Engine ground

- Operate starter briefly.

- Specified value: approx. battery voltage (B+)

If specified value is not obtained:

- Check wiring from terminal 2 on connector via fuse to fuel pump relay for open circuit or short to ground:

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

- Repair any open/short circuit as necessary.

If specified value is obtained:

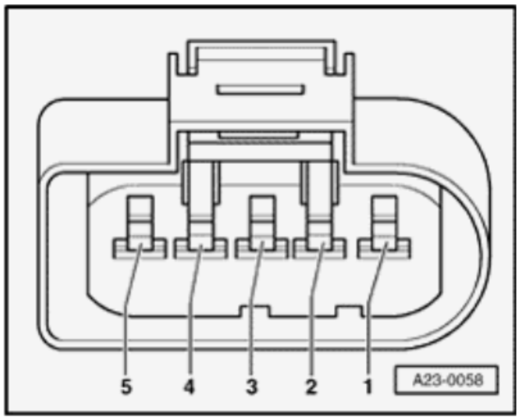

Fig. 156: Identifying 5-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect hand-held multimeter to terminals 2 and 3 of connector to measure voltage.
- Operate starter briefly (engine may start).

- Specified value: approx. battery voltage (B+)

NOTE: Engine control module ground (GND) is present at terminal 3 of the connector.

If specified value is not obtained:

- Check wiring. Refer to **Wiring to Mass Air Flow (MAF) sensor -G70-, checking**

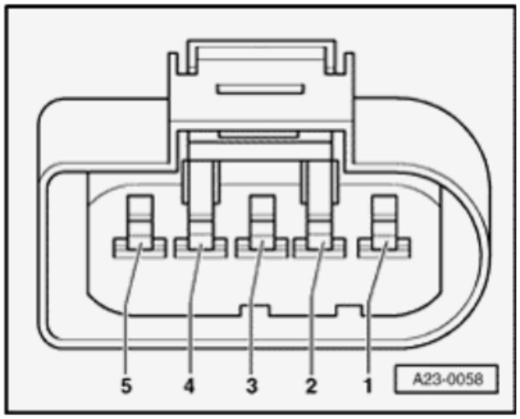

Fig. 157: Identifying 5-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect hand-held multimeter to terminals 3 and 4 of connector to measure voltage.

- Specified value: approx. 5 V

If specified value is not obtained:

- Check wiring. Refer to **Wiring to Mass Air Flow (MAF) sensor -G70-, checking**

Wiring to Mass Air Flow (MAF) sensor -G70-, checking

NOTE: The signal wire is also checked during the wiring check.

- Connect test box V.A.G 1598/31 to wiring harness for Engine Control Module (ECM); do not connect Engine Control Module (ECM). Refer to **Electrical testing using VAG1598/31 test box**.

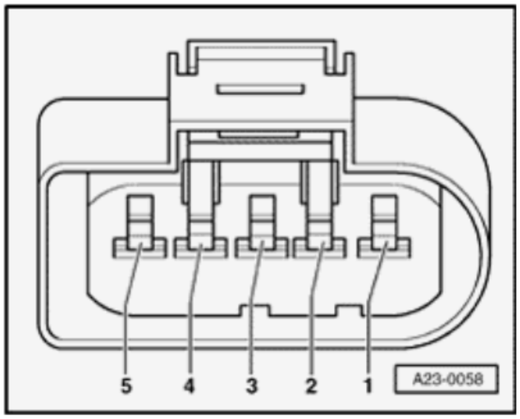

Fig. 158: Identifying 5-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check for open circuit, short to positive, or short to ground (GND) in following wiring connections:

Connector Terminal	Test box V.A.G 1598/31 Socket
3	27
4	53
5	29

- Repair any open/short circuit as necessary.
- Additionally check all wires for short to one another.

If the wiring is OK:

- Replace Mass Air Flow (MAF) sensor -G70-.

Intake air system for leaks (unmetered air), checking

Special tools, workshop equipment and other items required

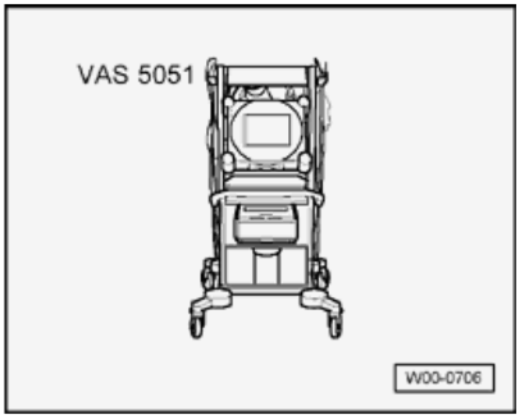

Fig. 159: Identifying Vehicle Diagnosis, Testing And Information System VAS 5051
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAS 5051 Vehicle diagnostic, testing and information system
- VAS 5051/1 Adapter
- Engine leak detector spray G 001 800 A1

NOTE:

- **The vacuum in the intake system will cause the leak detector spray to be drawn in with the unmetered air. The leak detector spray reduces the ignitability of the mixture. This leads to a drop in engine speed and to a significant increase of the CO content.**
- **Always adhere to the safety precautions listed on the container.**

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle**

diagnostic, testing and information system, connecting and selecting functions and select vehicle system "01 -Engine electronics" in selection. Engine must be run at idle.

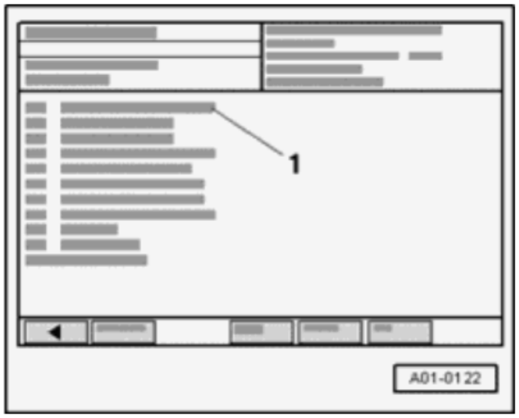

Fig. 160: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "08 - Read measured value block".

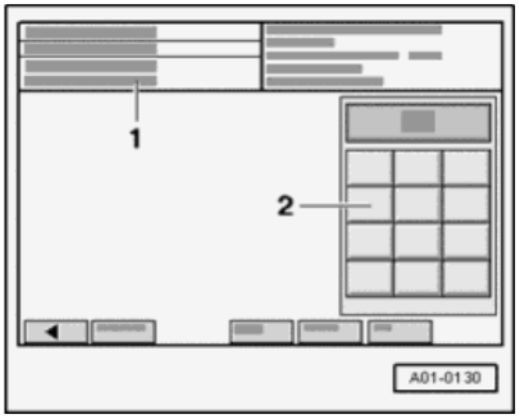

Fig. 161: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "001" for "display group number 001" in zone -2- and confirm entry by pressing -Q- button.

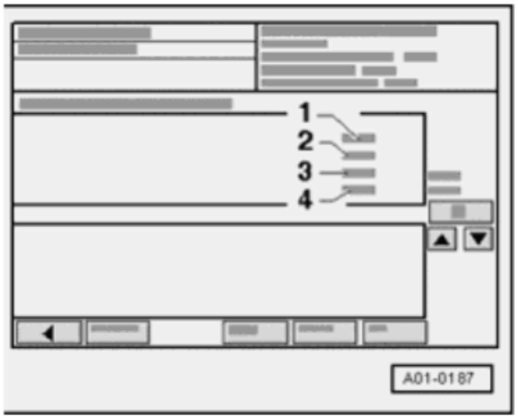

Fig. 162: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Note engine speed in display zone -1-.
- Systematically spray parts of intake system with engine leak detector spray.

If engine speed drops:

- Check sprayed areas of intake system for leaks and repair if necessary.
- Exit function "08 - Read measured value block" by pressing <-- key.

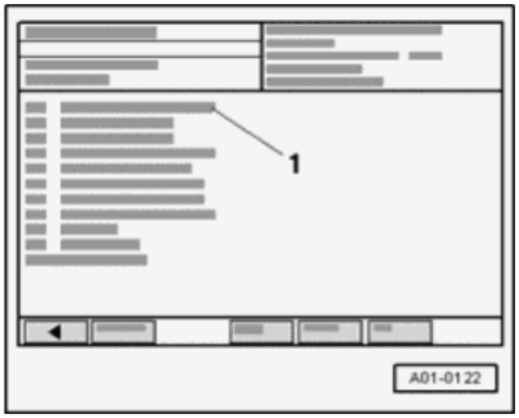

Fig. 163: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "06 - End output".
- Switch ignition off.

Fuel system, bleeding

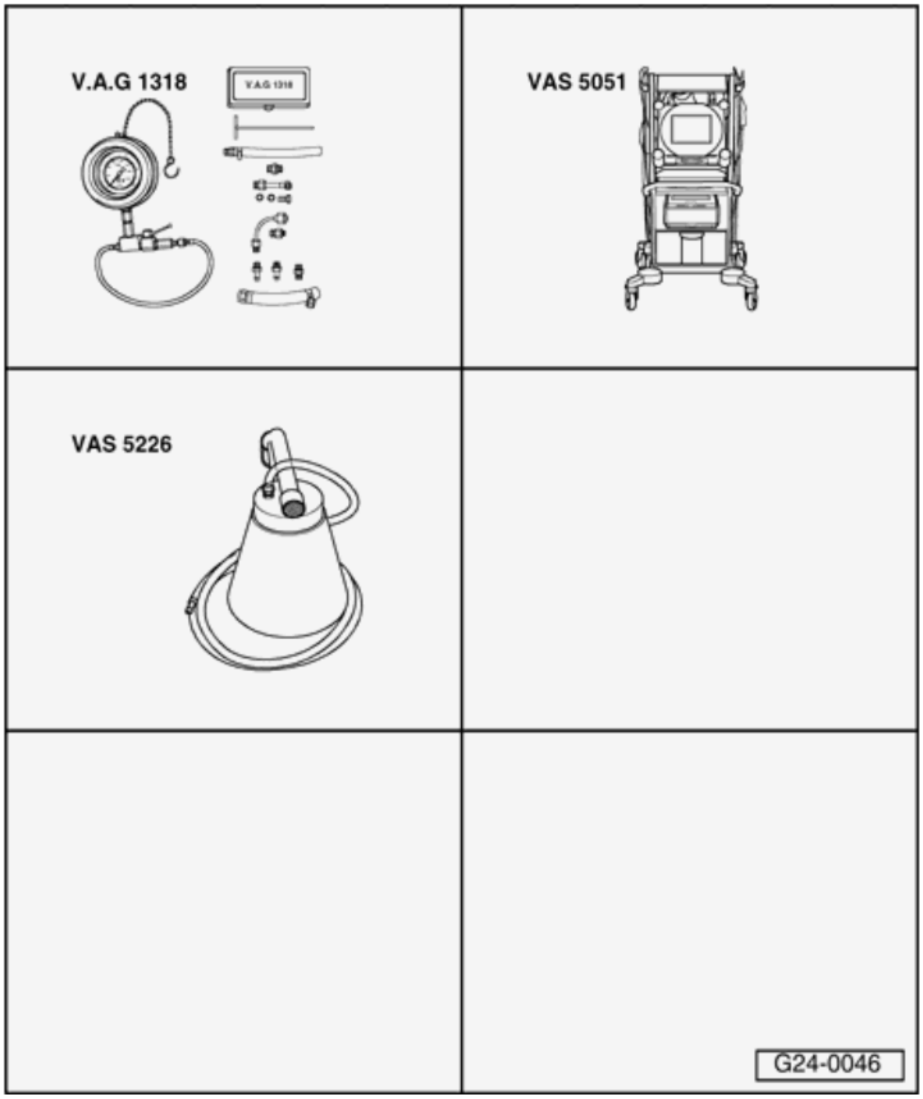

Fig. 164: Identifying Special Tools - Fuel System, Bleeding
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- V.A.G 1318 Pressure gauge
- V.A.G 1318/21 Adapter
- VAS Vehicle diagnostic, testing and information system
- VAS 5051/1 Adapter

- VAS 5226 Test box

Fuel system without return line

NOTE:

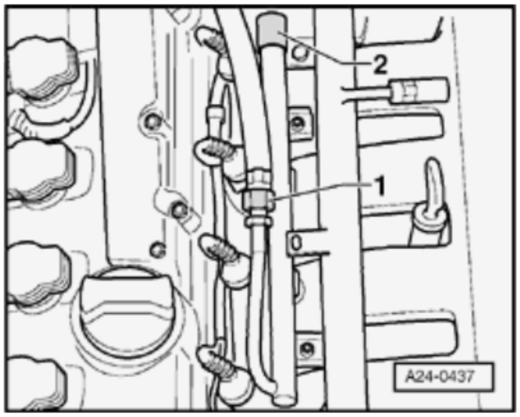

Fig. 165: Identifying Union Nut For Fuel Supply Line
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- **The fuel system without return line is recognized by the sealing cap -2- at connection for return line on the fuel rail.**
- **To prevent damage to catalytic converter the fuel system without return line must be bled after repair work on fuel rail or on fuel lines. The vehicle must only be started after bleeding**
- **Observe the rules for cleanliness. Refer to Rules for cleanliness.**

WARNING:

- **Work on the fuel system must only be performed when engine is cold!**
- **Fuel system is under pressure! Before opening system, place rags around the connection point. Then release pressure by carefully loosening connection.**

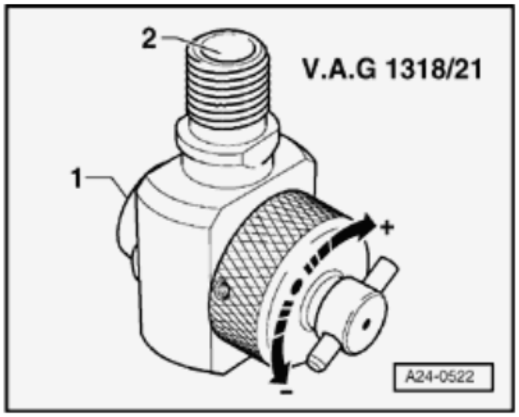

Fig. 166: Opening/Closing Shut-Off Valve On Special Tool V.A.G. 1318/21 By Turning In "+"/"-" Direction
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Close shut-off valve on special tool V.A.G. 1318/21 by turning in "-" direction up to stop.

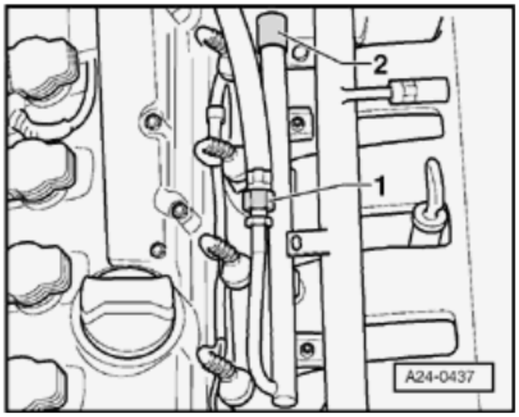

Fig. 167: Identifying Union Nut For Fuel Supply Line
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unthread sealing cap from bleeder connection -2- and connect V.A.G 1318/21 Adapter instead.

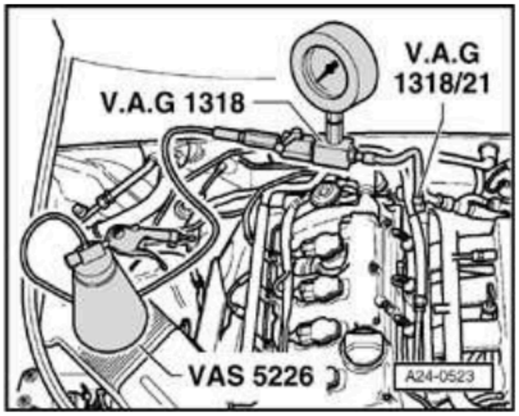

Fig. 168: Connecting V.A.G. 1318/21 Adapter And VAS 5226 Catch Reservoir With Assistance Of V.A.G. 1318 Pressure Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect V.A.G. 1318/21 Adapter and VAS 5226 catch reservoir with assistance of V.A.G. 1318 pressure gauge.

WARNING: All connection areas must be secured!

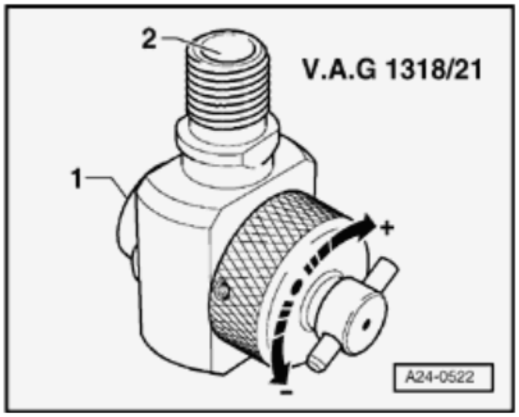

Fig. 169: Opening/Closing Shut-Off Valve On Special Tool V.A.G. 1318/21 By Turning In "+"/"-" Direction
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Open shut-off valve on special tool V.A.G. 1318/21 by turning in "+" direction.
- Switch ignition on.

- Fuel pump starts up briefly

Fuel system is bled when fuel exits into VAS 5226 catch reservoir without bubbles.

- Switch ignition off.

If the fuel pump does not operate, or fuel flows out on catch reservoir VAS 5226 continuously with bubbles:

- Connect VAS5051 tester and select control module for engine electronics using "address word" 01. Ignition must be switched on.
- Initiate output DTM and activate Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. Refer to **Output Diagnostic Test Mode (DTM)**.

NOTE: Fuel pump must run during activation time.

Fuel system is bled when fuel exits into VAS 5226 catch reservoir without bubbles.

- End function "03 - output Diagnostic Test Mode (DTM)" by pressing <-- button.

WARNING: Fuel system is under pressure! Before opening system, place rags around the connection point. Then release pressure by carefully loosening connection.

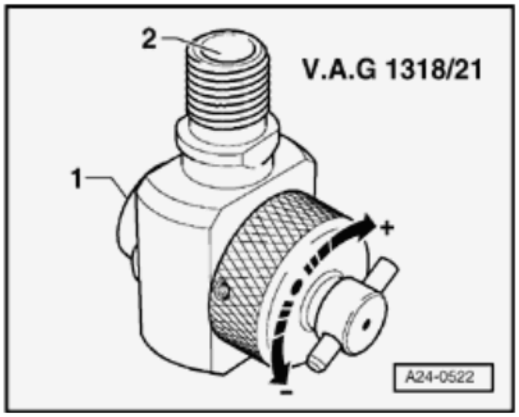

Fig. 170: Opening/Closing Shut-Off Valve On Special Tool V.A.G. 1318/21 By Turning In "+"/"-" Direction
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Close shut-off valve on special tool V.A.G. 1318/21 by turning in "-" direction up to stop.
- Remove V.A.G. 1318/21 Adapter from bleeder connection.

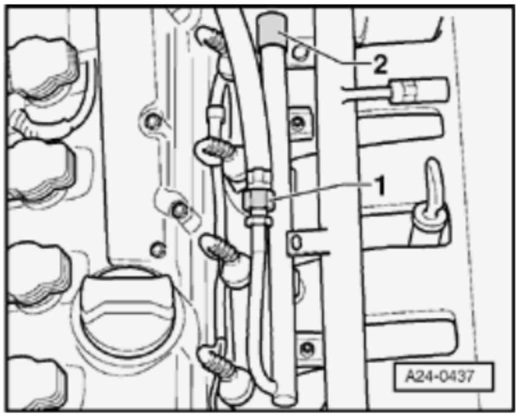

Fig. 171: Identifying Union Nut For Fuel Supply Line
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Thread on sealing cap to bleeder connection -2-.

OXYGEN SENSOR SYSTEM

Oxygen Sensor (O2S) and Oxygen Sensor control before catalytic converter, checking

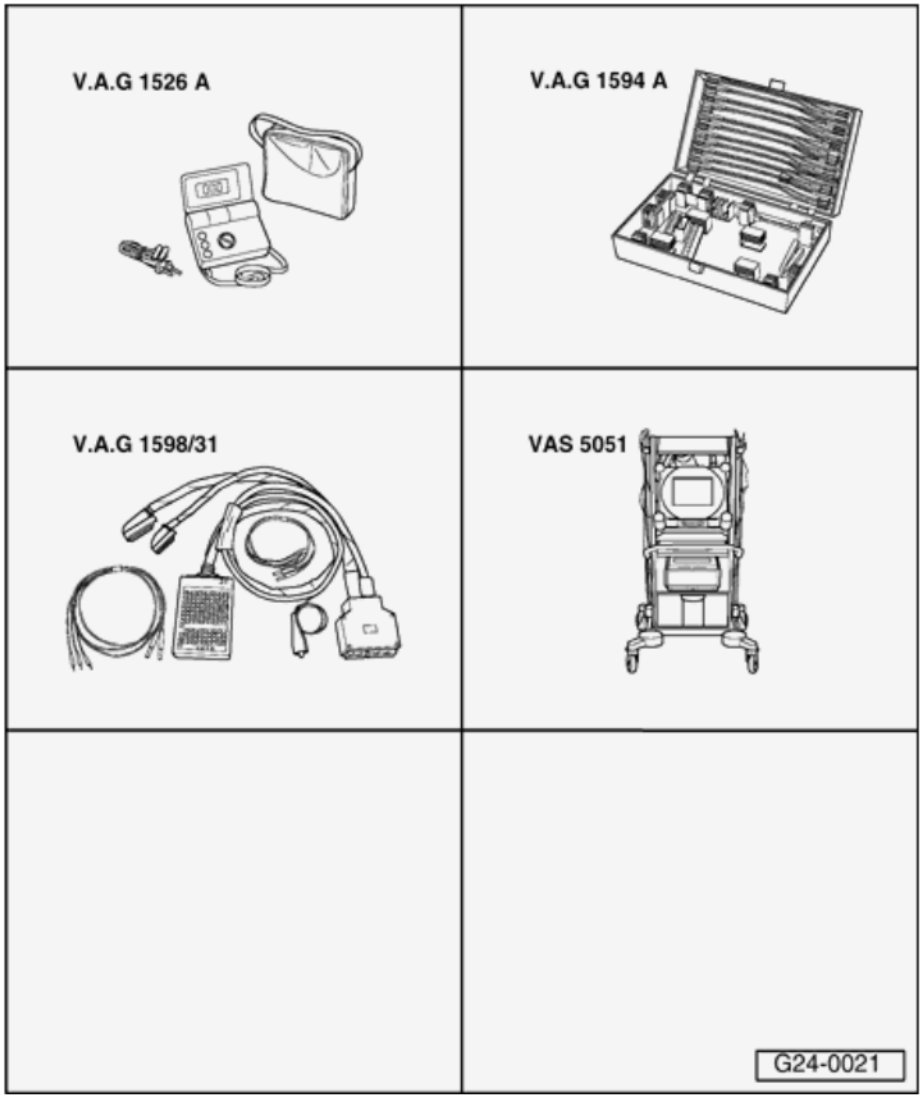

Fig. 172: Identifying Special Tools - Oxygen Sensor (O2S) And Oxygen Sensor Control Before Catalytic Converter, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box
- VAS 5051 Vehicle diagnostic, testing and information system
- VAS 5051/1 Adapter

Requirements

- No leaks in exhaust system

- Coolant temperature at least 80 ° C.

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection. Engine must be run at idle speed.

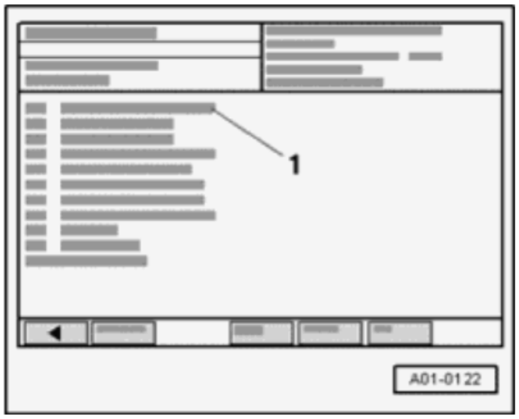

Fig. 173: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "04 - Basic setting".

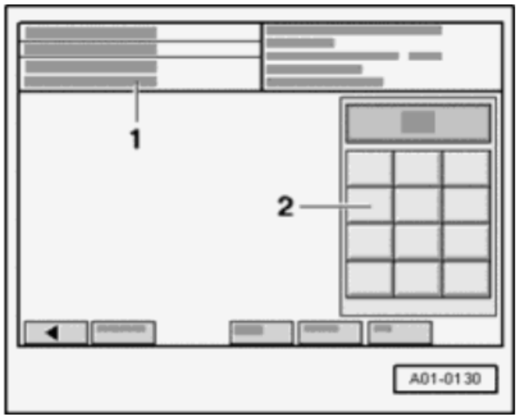

Fig. 174: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "030" for "display group number 030" in field -2- and confirm entry by pressing -Q- button.

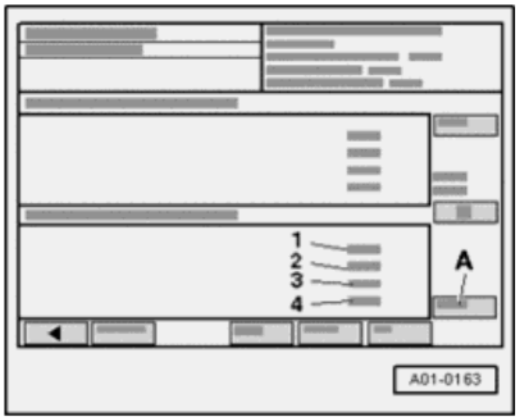

Fig. 175: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Check specification in display field -1-.

NOTE:

- **By increasing the engine speed the specified values are achieved more quickly.**
- **The "Oxygen Sensor status" indicates the condition of the Oxygen Sensor control and the Oxygen Sensor (O2S).**

	Display fields			
	1	2	3	4
Display group 030: Oxygen Sensor (O2S) status				
Display	**X X X**	X X X		
Display	**Oxygen Sensor (O2S) status, bank 1, sensor 1**	Oxygen Sensor (O2S) status, bank 1, sensor 2		
Range	**0 = off** **1 = on**	0 = off 1 = on		
Specified value	**1 1 1**	1 1 0		
	In 5-digit displays ignore 1. and 2. positions, in 4-digit displays ignore 1. position If specified value is not obtained. Refer to **Checking basic voltage** If specified value is obtained but there is a DTC stored in DTC memory, check oxygen sensor adaptation values and control. Refer to **Checking Oxygen Sensor (O2S) adaptation values and Oxygen Sensor (O2S) control**			

Significance of 3-digit readout of display group 030			
X	X	X	**Display fields 1 and 2:**

		X	Oxygen Sensor (O2S) control 0 = not active; 1 = active
	X		Oxygen Sensor (O2S) condition: 0 = not active; 1 = active
X			Condition of Oxygen Sensor (O2S) heating: 0 = not active; 1 = active

NOTE: The first digit of the 3-digit display (heating) fluctuates between 0 and 1.

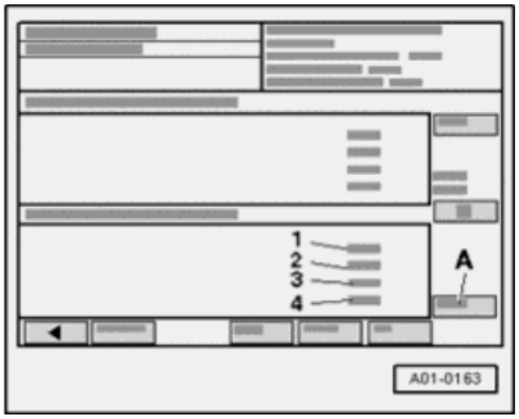

Fig. 176: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Only continue test if display in display field -1- has reached "111" at least once.
- Press <-- button.

Checking Oxygen Sensor (O2S) adaptation values and Oxygen Sensor (O2S) control

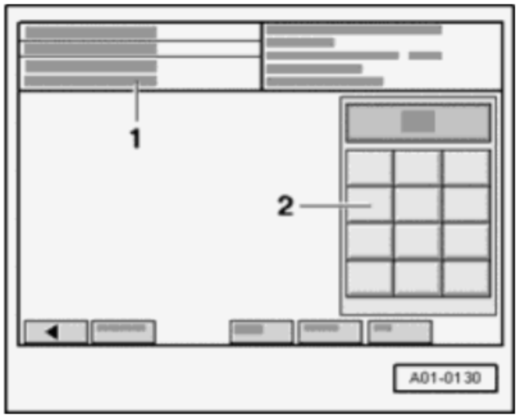

Fig. 177: Diagnostic System VAS 5051: Display

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "032" for "display group number 032" in field -2- and confirm entry by pressing -Q- button.

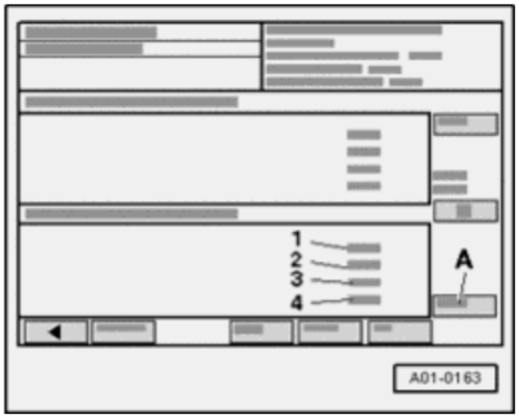

Fig. 178: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Check indication in display groups -1-and -2-.

	Display fields			
	1	2	3	4
Display group 032: Oxygen Sensor (O2S) adaptation values (bank 1, sensor 1)				
Display	**xx.x %**	**xx.x %**		
Display	**Oxygen Sensor (O2S) adaptation value bank 1, sensor 1 at idle (additive)**	**Oxygen Sensor (O2S) adaptation value bank 1, sensor 1 at partial throttle (multiplicative)**		
Specified value	**-5.0...5.0%**	**-10.0...10.0%**		
If the specified value is not obtained. Refer to **Evaluating display group 032**				

- Press <-- button.

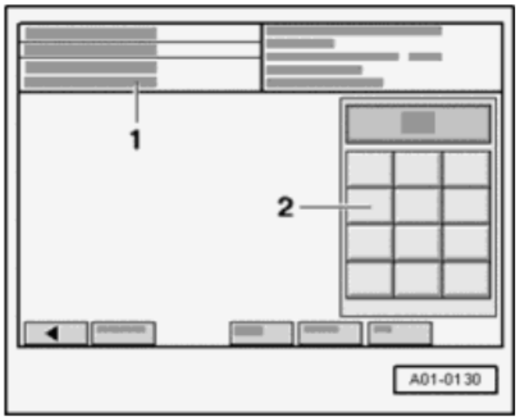

Fig. 179: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "033" for "display group number 033" in field -2- and confirm entry by pressing -Q- button.

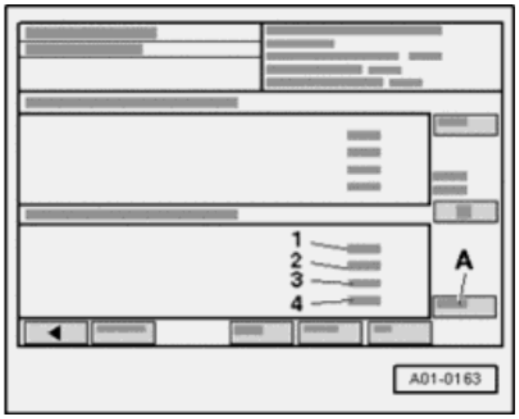

Fig. 180: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Check indication in display groups -1-and -2-.

	Display fields			
	1	2	3	4
Display group 033: Oxygen Sensor control (bank 1, sensor 1)				
Display	**xx.x %**	**x.xxx V**		
Display	**Oxygen Sensor**	**Oxygen Sensor**		

	control bank 1, sensor 1	**voltage bank 1, sensor 1**		
Specified value	**In range - 10.0...10.0% value must fluctuate at least 2%**	**1.3...1.7 volts**		
If specified value is not obtained. Refer to Note	If specified value is not obtained. Refer to **Evaluating display group 032**, **Evaluating display group 033**			

Note on display field 2:

Displayed is the Oxygen Sensor (O2S) voltage signal which was prepared and smoothed in the Engine Control Module (ECM). 1.5 V in the display corresponds to Oxygen Sensor (O2S) 1.

If the specified result is not obtained in display field, or if the value does not fluctuate by at least 2%:

- Perform test drive to free Oxygen Sensor (O2S) from any possible residues and repeat test.

If the specified result is not obtained in display field 1 3, or if the value does not fluctuate by at least 2%, even after the test drive:

- Check basic voltage. Refer to **Checking basic voltage**.
- Check Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC) heating. Refer to **Oxygen Sensor (O2S) heater -Z19- for oxygen sensor before Three Way Catalytic Converter (TWC), checking**.
- Check Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC) aging. Refer to **Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC), checking**.

Evaluating display group 032

Display field: 1/2	Possible cause	Corrective action
Oxygen Sensor (O2S) adaptation values below specified range	• Leakage in intake area (pressure side between turbocharger and intake line)	○ Check intake system for leaks and repair false air. Refer to **Intake air system for leaks (unmetered air), checking**
	• Oil thinning	○ Change oil or perform swift country (open) road test
	• High oil consumption	
	• Mass Air Flow (MAF) sensor -G70- faulty	○ Check Mass Air Flow (MAF) sensor -G70-. Refer

		to **Mass Air Flow (MAF) sensor -G70-, checking**
	• Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- remains stuck in open position	○ Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. Refer to **Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, checking**
	• Fuel pressure too high	○ Check fuel pressure regulator. Refer to **System pressure, fuel pressure regulator and residual pressure, checking**
	• Fuel injector does not close	○ Check fuel injectors. Refer to **Fuel injectors, checking**
	• Oxygen Sensor (O2S) heating inoperative • Oxygen Sensor (O2S) inoperative	○ Check Oxygen Sensor (O2S) heating. Refer to **Oxygen Sensor (O2S) heater -Z19- for oxygen sensor before Three Way Catalytic Converter (TWC), checking**

Evaluating display group 032

Display field: 1/2	Possible cause	Corrective action
Oxygen Sensor (O2S) adaptation values above specified range.	• Air leak into intake system	○ Check intake system for leaks and repair false air. Refer to **Intake air system for leaks (unmetered air), checking**
	• Fuel pressure too low	○ Check fuel system pressure. Refer to **System pressure, fuel pressure regulator and residual pressure, checking**
	• Mass Air Flow (MAF) sensor -G70- faulty	○ Check Mass Air Flow (MAF) sensor -G70-. Refer to **Mass Air Flow (MAF) sensor -G70-, checking**
	• Oxygen Sensor (O2S) heating inoperative • Oxygen Sensor (O2S)	○ Check Oxygen Sensor (O2S) heating. Refer to **Oxygen Sensor (O2S)**

	inoperative	**heater -Z19- for oxygen sensor before Three Way Catalytic Converter (TWC), checking**
	• Injector only opens partially or not at all	○ Check injectors. Refer to **Fuel injectors, checking**
	• Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- sticks	○ Check EVAP valve -N80-. Refer to **Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, checking**

Evaluating display group 033

Display field: 2	Possible cause	Corrective action
Greater than 4.800 V	• Short to positive (B+) in wiring between Oxygen Sensor (O2S) and Engine Control Module (ECM) • Oxygen Sensor (O2S) faulty	○ Check Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). Refer to **Checking Oxygen Sensor (O2S) wiring**
Less than 0.130 V	• Short to ground (GND) in wiring between Oxygen Sensor (O2S) and Engine Control Module (ECM) • Oxygen Sensor (O2S) faulty	○ Check Oxygen Sensor (O2S) wiring. Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

Checking basic voltage

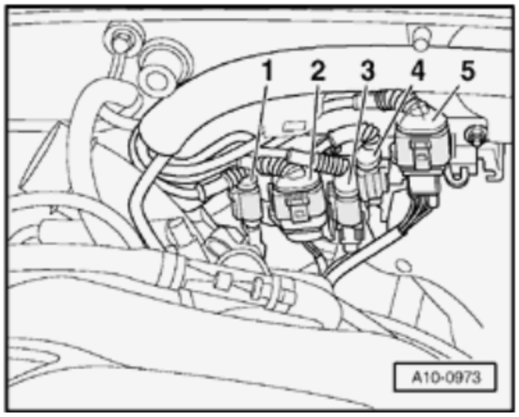

Fig. 181: Identifying Connectors For Oxygen Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- ○ Disconnect 6-pin connector (black) -5- to Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC).

NOTE:

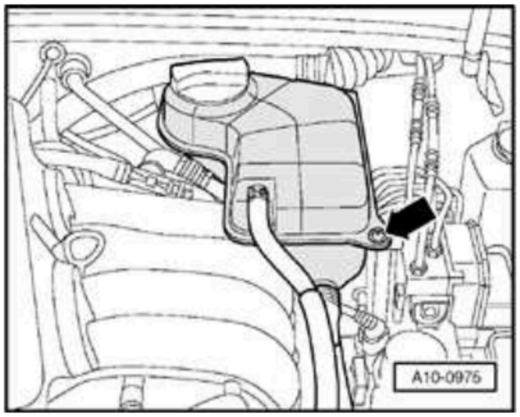

Fig. 182: Removing Coolant Expansion Tank Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

To gain access to the connector, remove coolant expansion tank bolt (arrow) and move expansion tank to side. Fuel hoses remain connected.

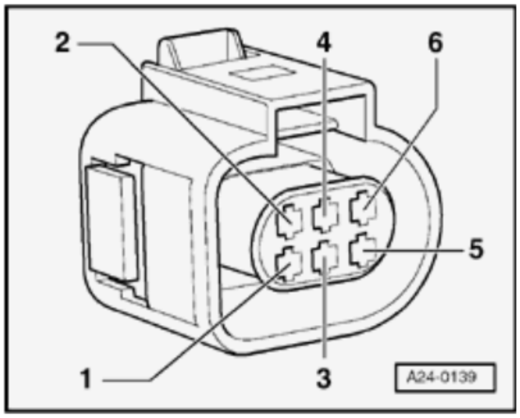

Fig. 183: Identifying 6-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter between terminals 1 and 5 to measure voltage.
- Switch ignition on.

- Specified value: 0.400...0.500 V

- Switch ignition off.

If specified value is not obtained:

- Check Oxygen Sensor (O2S) wiring.

If specified value is obtained:

- Replace Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC).

Checking Oxygen Sensor (O2S) wiring

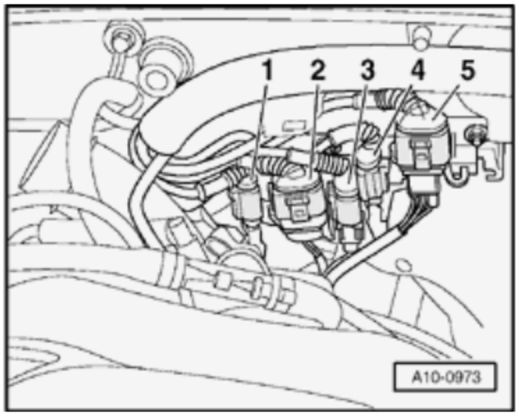

Fig. 184: Identifying Connectors For Oxygen Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect 6-pin connector (black) -5- to Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC).

NOTE:

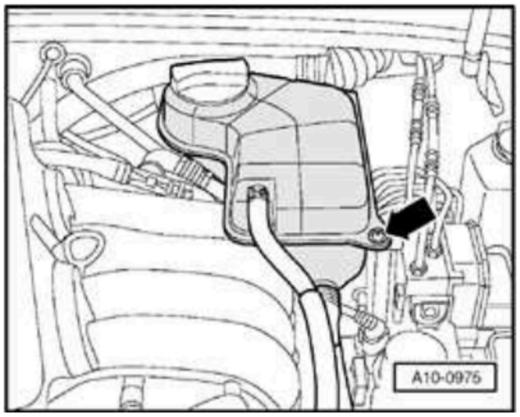

Fig. 185: Removing Coolant Expansion Tank Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

To gain access to the connector, remove coolant expansion tank bolt (arrow) and move expansion tank to side. Fuel hoses remain connected.

- Connect test box V.A.G 1598/31 to wiring harness for Engine Control Module (ECM); do not connect Engine Control Module (ECM). Refer to **Electrical testing using VAG1598/31 test box**.

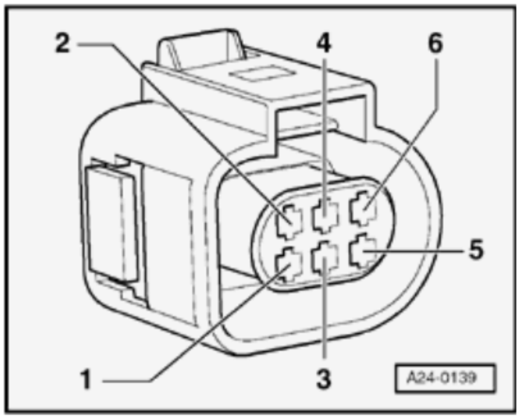

Fig. 186: Identifying 6-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Test for open circuit in the following wiring connections.

Connector Terminal	Test box V.A.G 1598/31 Socket
1	70
2	71
5	51
6	52

- Repair open circuit, if necessary.
- Check for shorts between two wires.

If the wiring is OK:

- Replace Engine Control Module (ECM). Refer to **Engine Control Module (ECM) (without metal anti-theft housing), replacing**.

Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC), checking

Special tools and workshop equipment required

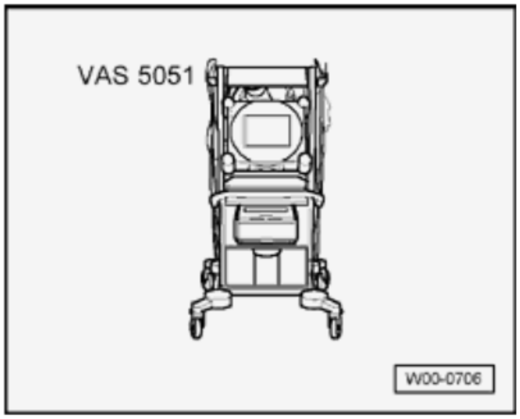

Fig. 187: Identifying Vehicle Diagnosis, Testing And Information System VAS 5051
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAS 5051 Vehicle diagnostic, testing and information system
- VAS 5051/1 Adapter

Requirements

- Coolant temperature at least 80 ° C.

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection. Engine must be run at idle.

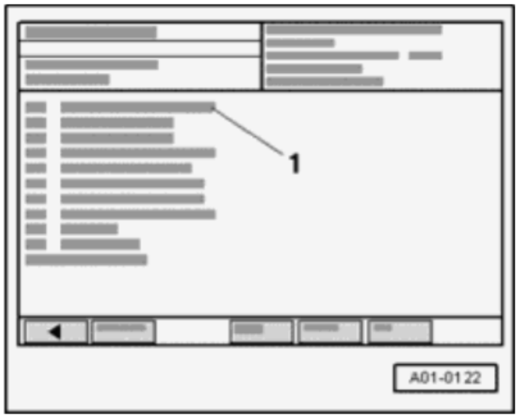

Fig. 188: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "04 - Basic setting".

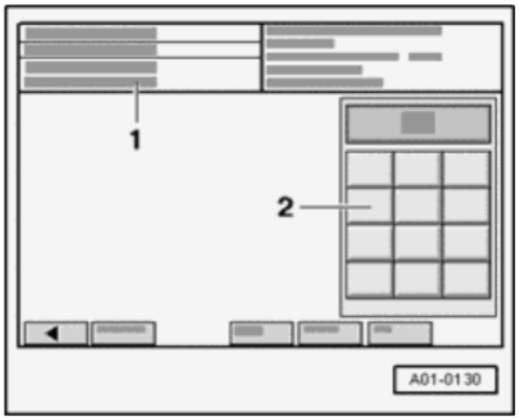

Fig. 189: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "034" for "display group number 034" in field -2- and confirm entry by pressing -Q- button.

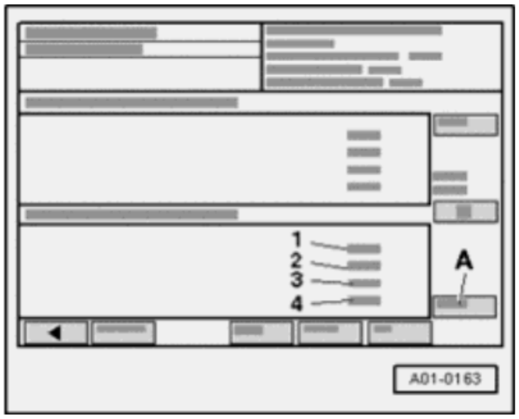

Fig. 190: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Press accelerator and brake pedal simultaneously, engine speed increases to approx. 2300 rpm.

Conditions

- Accelerator and brake pedal pressed simultaneously, engine runs at approx. 2300 rpm.

- Check indication in display groups -3-and -4-.

	Display fields			
	1	2	3	4
Display group 034: Diagnosis, Oxygen Sensor (O2S) aging (bank 1, sensor 1)				
Display	xxxx rpm	xxx ° C	**x.x**	**---**
Display	Engine speed	Exhaust gas temperature	**Dynamics factor**	Diagnosis status
Range				**Test OFF** **Test ON** **B1-P1 OK** **B1-P1 NOK**
Specified value	approx. 2300 rpm	Above 350 ° C	**0.5...2.5**	B1-P1 OK
			If specified value is not obtained. Refer to note below	

Note on display fields 3 and 4:

The dynamics factor is the characteristic for the aging of the Oxygen Sensor (O2S). The lower the dynamics factor the more advanced is the aging of the Oxygen Sensor (O2S).

If specification in display field 3 or 4 is not obtained:

- Perform test drive to free Oxygen Sensor (O2S) from any possible residues and repeat test.

If specified value in display field 3 or 4 is not obtained, even after a test drive has been performed:

- Replace Oxygen Sensor (O2S) 1 before Three Way Catalytic Converter (TWC).

Oxygen Sensor (O2S) heater -Z19- for oxygen sensor before Three Way Catalytic Converter (TWC), checking

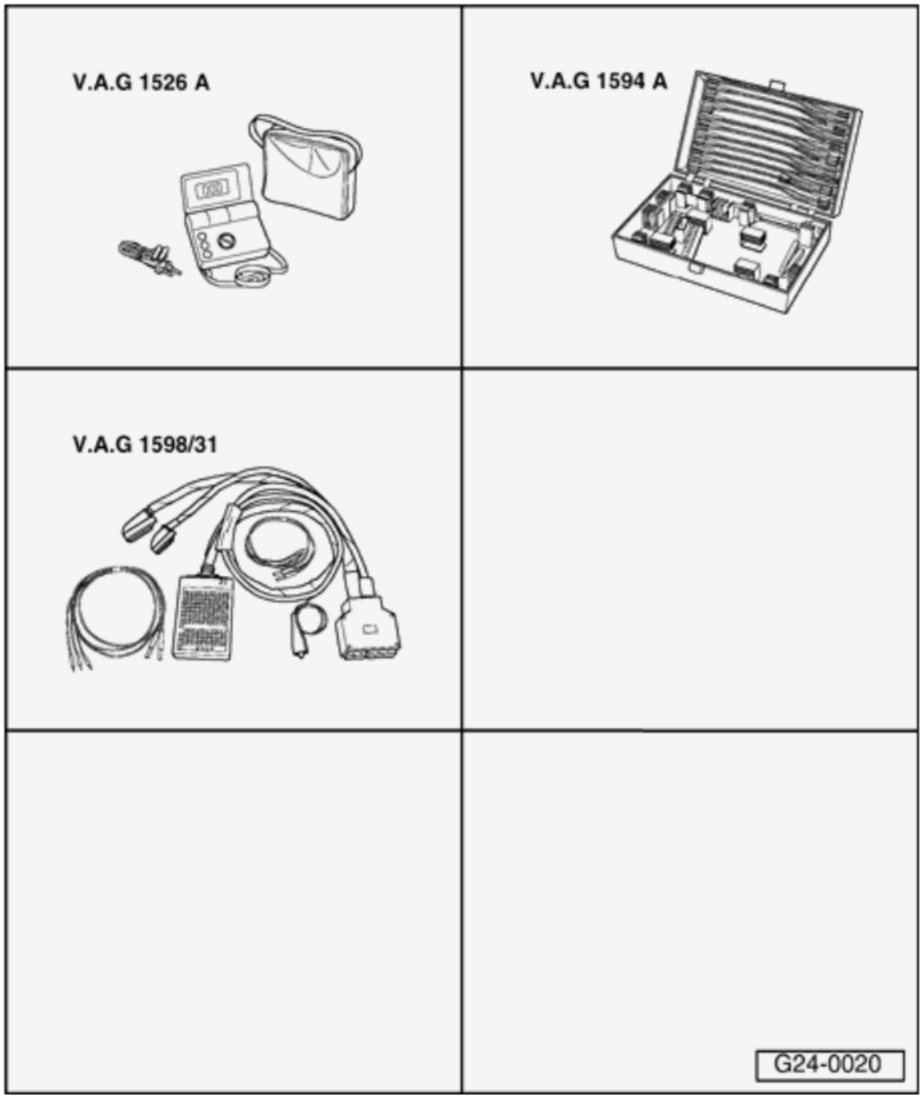

Fig. 191: Oxygen Sensor (O2S) Heater -Z19- For Oxygen Sensor Before Three Way Catalytic Converter (TWC), Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box

Requirements

- Coolant temperature at least 80 ° C
- Fuse for Oxygen Sensor (O2S) heating OK.

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

Work sequence

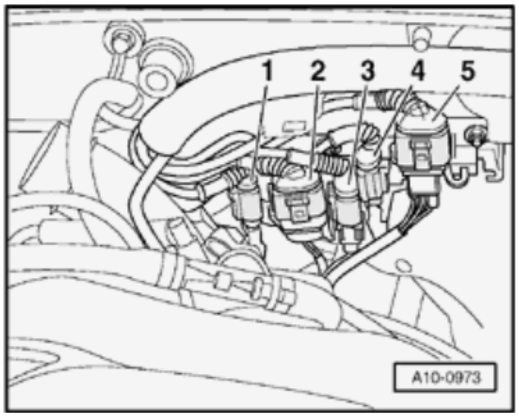

Fig. 192: Identifying Connectors For Oxygen Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect 6-pin connector (black) -5- to Oxygen Sensor before Three Way Catalytic Converter (TWC).

NOTE:

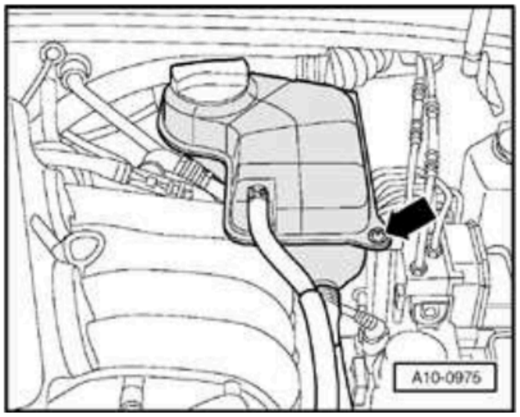

Fig. 193: Removing Coolant Expansion Tank Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

To gain access to the connector, remove coolant expansion tank bolt (arrow) and move expansion tank to side. Fuel hoses remain connected.

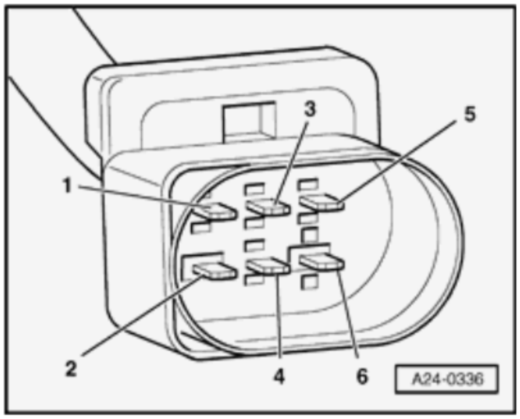

Fig. 194: Identifying 6-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter between terminals 3 and 4 to measure resistance.

- Specified value at room temperature 2.5 to 10 ohms

If specified value is not obtained:

- Replace Heated Oxygen Sensor (HO2S) -G39-.

If specified value is obtained:

Checking voltage supply for Oxygen Sensor heating

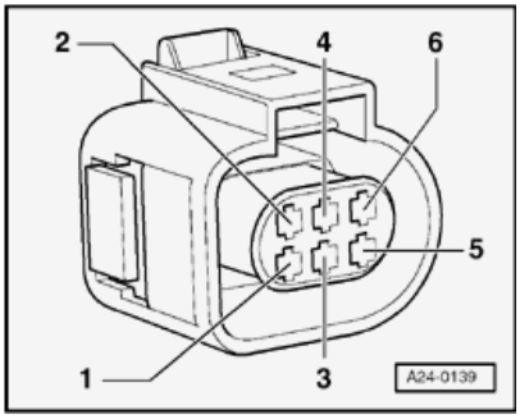

Fig. 195: Identifying 6-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter between terminals 3 and 4 to measure voltage.
- Start engine.

- Specified value: approx. battery voltage (B+)

NOTE: **Points at which Oxygen Sensor heating is switched on and off by Engine Control Module (ECM) can be observed in "Reading measured value block" function, display group number 041 and display zone 2.**

If no voltage is present:

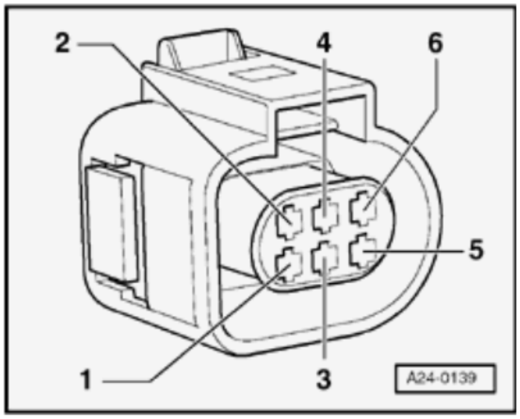

Fig. 196: Identifying 6-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter as follows to measure voltage.

Connector Terminal	Measure to
3	Engine Ground (GND)

- Operate starter briefly.
- Specified value: approx. battery voltage (B+)

If no voltage is present:

- Check wiring from terminal 3 on the connector via the fuse to fuel pump relay for an open circuit:

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

If voltage supply is OK:

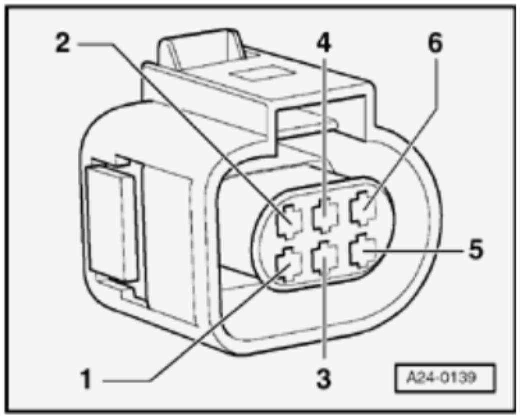

Fig. 197: Identifying 6-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter as follows to measure voltage:

Connector Terminal	Measure to
4 (engine control module ground activation)	Battery positive (B+)

- Start engine.

- Specified value: approx. battery voltage (B+)

NOTE: **Points at which Oxygen Sensor heating is switched on and off by engine control module can be observed in "Reading measured value block" function, display group number 041 and display zone 2.**

- Switch ignition off.

If no voltage is present:

- Connect test box V.A.G 1598/31 to wiring harness for engine control module; do not connect directly to Engine Control Module (ECM). Refer to **Electrical testing using VAG1598/31 test box**.

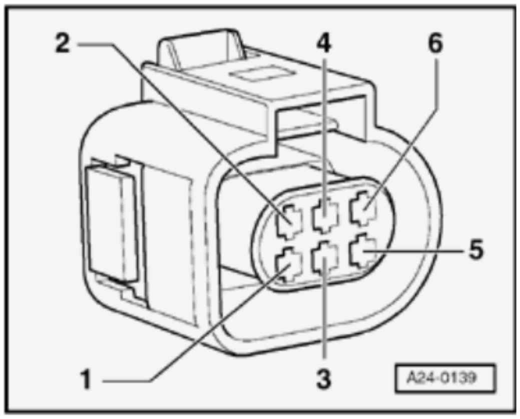

Fig. 198: Identifying 6-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check for open circuit in following wiring connections:

Connector Terminal	Test box V.A.G 1598/31 Socket
4	5

- Repair open circuit, if necessary.

If wiring is OK but there is no ground for the Oxygen Sensor heating:

- Replace Engine Control Module (ECM). Refer to **Engine Control Module (ECM) (without metal anti-theft housing), replacing**.

Oxygen Sensor (O2S) and Oxygen Sensor control before Three Way Catalytic Converter (TWC), checking

NOTE: **The Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC) (Bank 1, sensor 1) changes to Lambda 1. If this Oxygen Sensor (O2S) is damaged, e.g. through contamination or overheating, the control value can be changed. Deviations from Lambda 1 are recorded by the Oxygen Sensor (O2S) after the Three Way Catalytic Converter (TWC) (Bank 1, sensor 2). If these deviations are recognized downward or upward it influences the control before the Three Way Catalytic Converter (TWC) in such a way that it is generally raised or lowered accordingly.**

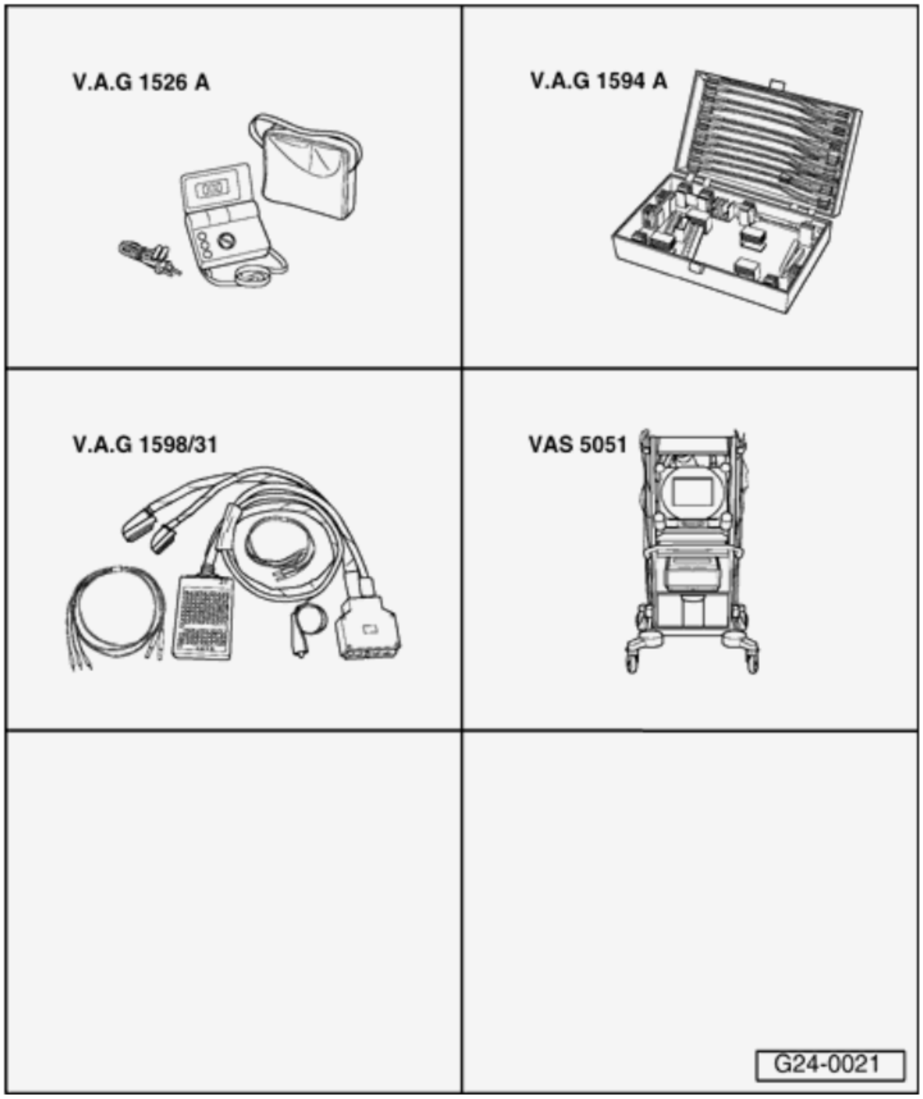

Fig. 199: Identifying Special Tools - Oxygen Sensor (O2S) And Oxygen Sensor Control Before Three Way Catalytic Converter (TWC), Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box
- VAS 5051 Vehicle diagnostic, testing and information system

- VAS 5051/1 Adapter

Requirements

- No leaks in exhaust system

- Coolant temperature at least 80 ° C.

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection. Engine must be run at idle.

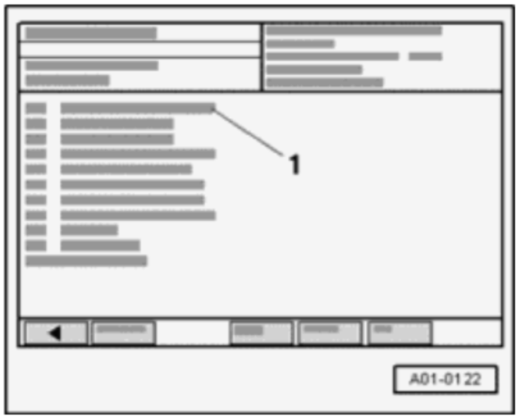

Fig. 200: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "04 - Basic setting".

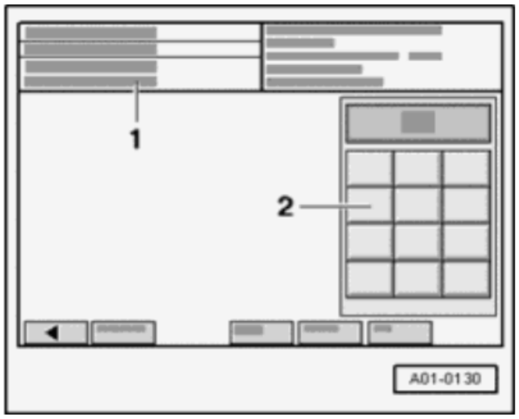

Fig. 201: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "030" for "display group number 030" in field -2- and confirm entry by pressing -Q- button.

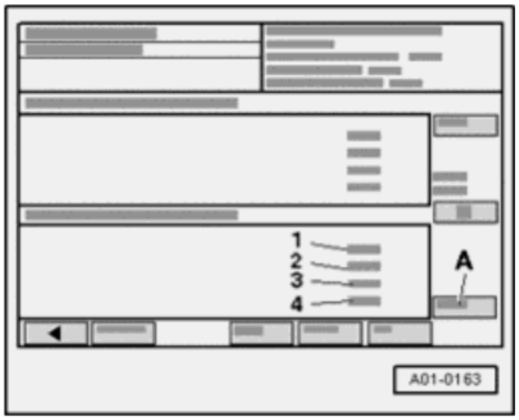

Fig. 202: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Check indication in display group -2-.

NOTE:

- **By increasing the engine speed the specified values are obtained more quickly.**
- **The "Oxygen Sensor status" indicates the condition of the Oxygen Sensor control and the Oxygen Sensor (O2S).**

	Display fields			
	1	2	3	4
Display group 030: Oxygen Sensor (O2S) status at idle				
Display	X X X	**X X X**		
Display	Oxygen Sensor (O2S) status, bank 1, sensor 1	**Oxygen Sensor (O2S) status bank 1, sensor 2**		
Range	0 = off 1 = on	**0 = off** **1 = on**		
Specified value	1 1 1	**1 1 0**		
Note	**In 4-digit displays ignore position -1-.** If specified value is not obtained. Refer to **Oxygen Sensor (O2S) heater 1 -Z29- behind Three Way Catalytic Converter (TWC), checking**			

Significance of 3-digit readout of display group 030			
X	X	X	**Display fields 1 and 2:**
		X	Oxygen sensor control 0 = not active; 1 = active
	X		Oxygen Sensor (O2S)

			condition: 0 = not active; 1 = active
X			Condition of Oxygen Sensor (O2S) heating: 0 = not active; 1 = active

NOTE:

- **The first digit of the 3-digit display (heating) fluctuates between 0 and 1.**
- **The Oxygen Sensor control of the Oxygen Sensor (O2S) after Three Way Catalytic Converter (TWC). (B1-S2) is inactive without engine load.**

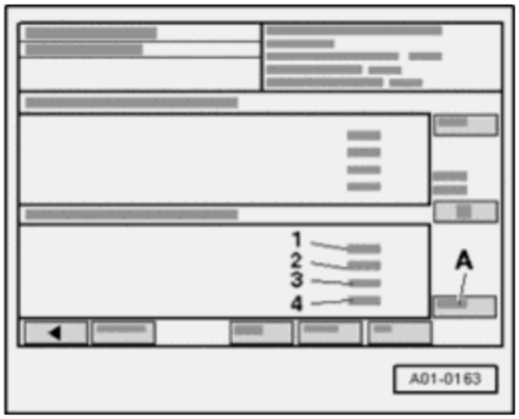

Fig. 203: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Only continue test if display in display field -2- has reached "110" at least once.
- Press <-- button.

Oxygen Sensor control behind Three Way Catalytic Converter (TWC), checking

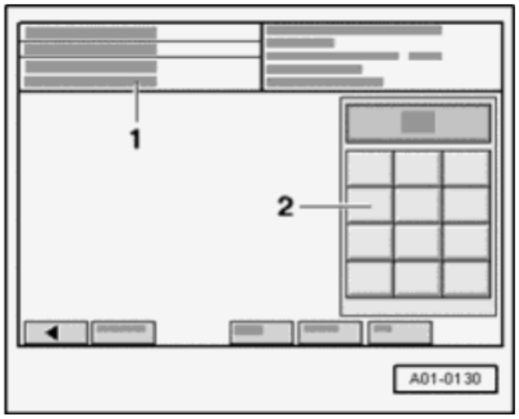

Fig. 204: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "037" for "display group number 037" in field -2- and confirm entry by pressing -Q- button.

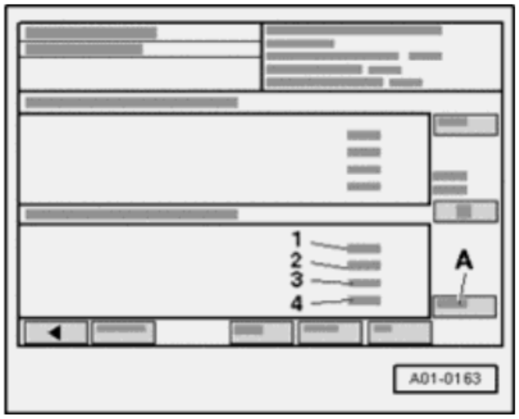

Fig. 205: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Check Oxygen Sensor (O2S) voltage in display field -2-.
- Check Oxygen Sensor (O2S) correction value in display field-3- and diagnosis result in display field -4-.

	Display fields			
	1	2	3	4
Display group 037: Diagnosis, Oxygen Sensor (O2S) control system (bank 1, sensor 2)				
Display	xxx %	**x.xxx V**	**x.xx**	**---**
Display	Engine load	**Oxygen Sensor (O2S) voltage, bank 1, sensor 2**	**Oxygen Sensor (O2S) voltage between bank 1, sensor 1 and bank 1, sensor 2**	Diagnosis status
Range				**Test OFF** **Test ON** **Syst. OK** **Syst. NOK**
Specified value	13...45%	**0.100...0.950 volts**	**-0.02...0.02**	Syst. OK
	If specified value is not obtained: Evaluation. Refer to **Evaluating display group 037**		**If the display shows "Syst. NOK". Refer to note below**	

Note on display field 2:

The Oxygen Sensor (O2S) voltage bank 1, sensor 2 should be kept as constant as possible. Strong voltage fluctuations indicate a damaged Three Way Catalytic Converter (TWC).

Evaluating display group 037

Display field: 2	Possible cause	Corrective action
Constant approx. 0.450 V	• Open circuit in line 4 between Oxygen Sensor (O2S) and engine control module (ECM)	○ Check basic voltage. Refer to **Checking basic voltage**
	• Open circuit in line 3 between Oxygen Sensor (O2S) and engine control module (ECM)	
Greater than 0.950 V	• Short to positive in line 4 between Oxygen Sensor (O2S) and engine control module (ECM)	○ Test Oxygen Sensor wiring, Oxygen Sensor behind Three Way Catalytic Converter (TWC). Refer to **Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC), checking**
Less than 0.100 V	• Short to ground (GND) in line 4 between Oxygen Sensor (O2S) and engine control module (ECM)	

If specification in display field 3 or 4 is not obtained:

- Perform test drive to free Oxygen Sensor (O2S) from any possible residues and repeat test.

If specified value in display field 3 or 4 is not obtained, even after a test drive has been performed:

- Replace Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC).

NOTE: **If the Oxygen Sensor (O2S) voltage is OK and after a road test the Oxygen Sensor correction value is still outside the specification, this indicates aging of the Oxygen Sensor before the Three Way Catalytic Converter (TWC).**

Checking basic voltage

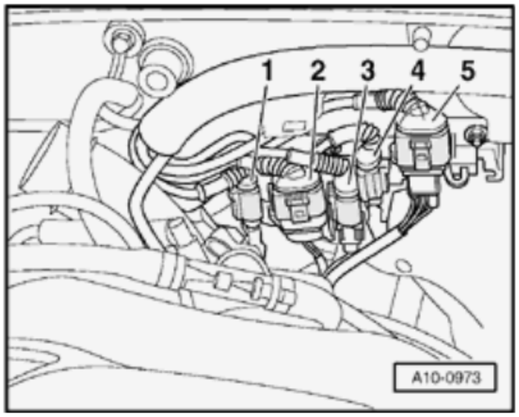

Fig. 206: Identifying Connectors For Oxygen Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect 4-pin connector -2- (brown) to Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC).

NOTE:

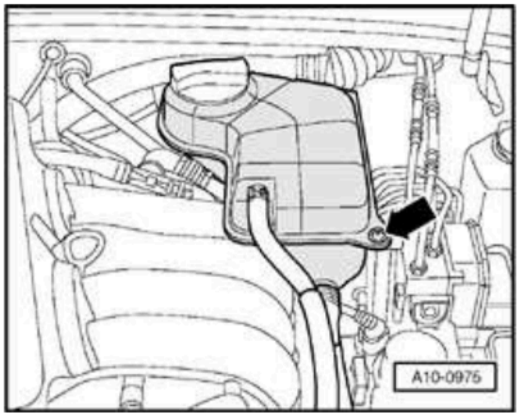

Fig. 207: Removing Coolant Expansion Tank Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

To gain access to the connector, remove coolant expansion tank bolt (arrow) and move expansion tank to side. Fuel hoses remain connected.

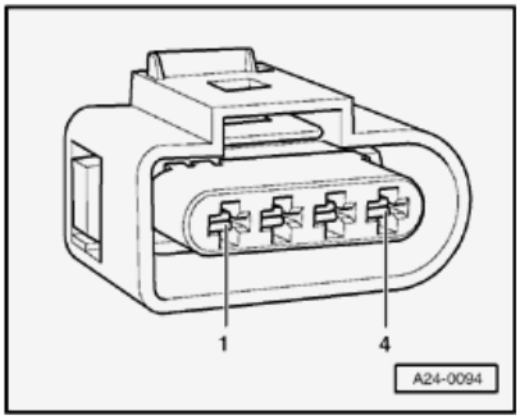

Fig. 208: Identifying Connector Terminals 1 And 4
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter between terminals 3 and 4 to measure voltage.
- Switch ignition on.

- Specified value: 0.400 to 0.500 V

- Switch ignition off.

If specified value is obtained:

- Replace Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-.

If specified value is not obtained:

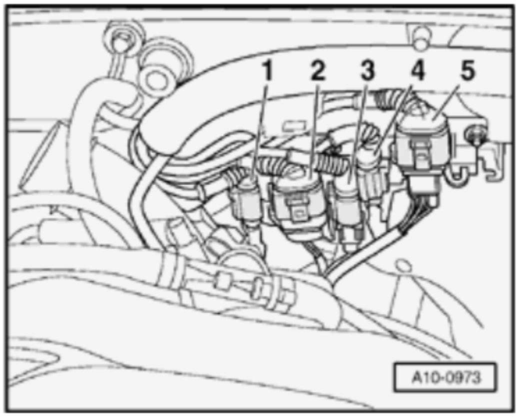

Fig. 209: Identifying Connectors For Oxygen Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect 4-pin connector -2- (brown) to Heated Oxygen Sensor (HO2S) -G39-.

NOTE:

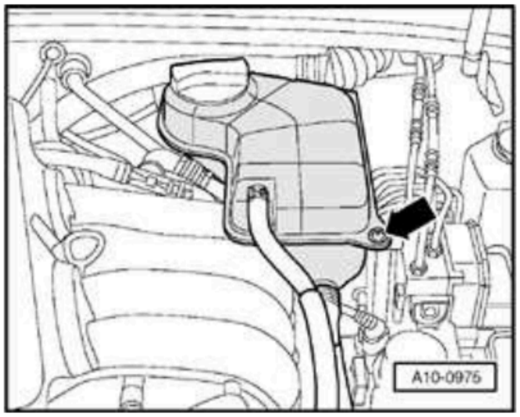

Fig. 210: Removing Coolant Expansion Tank Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

To gain access to the connector, remove coolant expansion tank bolt (arrow) and move expansion tank to side. Fuel hoses remain connected.

- Connect test box V.A.G 1598/31 to wiring harness for Engine Control Module (ECM); do not connect Engine Control Module (ECM). Refer to **Electrical testing using VAG1598/31 test box**.

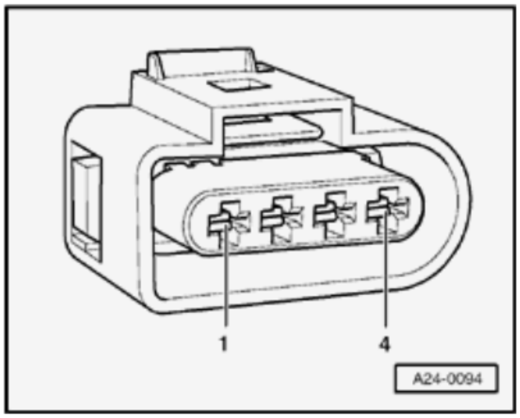

Fig. 211: Identifying Connector Terminals 1 And 4
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Test for open circuit in following wiring connections.

Connector Terminal	Test box V.A.G 1598/31 Socket
3	68
4	69

- Repair open circuit, if necessary.
- Check for shorts between two wires.

If wiring is OK:

- Replace Engine Control Module (ECM). Refer to **Engine Control Module (ECM) (without metal anti-theft housing), replacing**

Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC), checking

Special tools and workshop equipment required

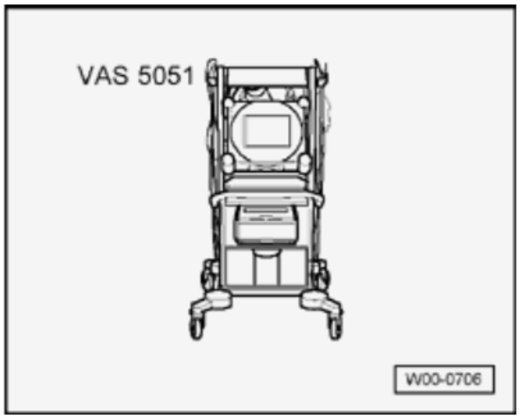

Fig. 212: Identifying Vehicle Diagnosis, Testing And Information System VAS 5051
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAS 5051 Vehicle diagnostic, testing and information system
- VAS 5051/1 Adapter

Requirements

- Coolant temperature at least 80 ° C.

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection. Engine must be run at idle.

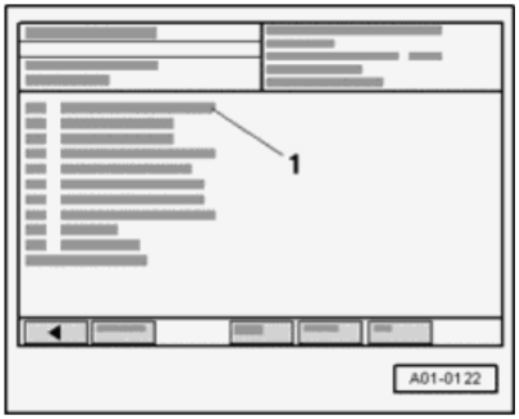

Fig. 213: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "04 - Basic setting".

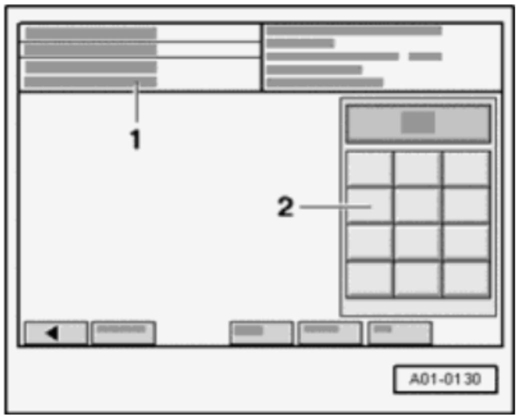

Fig. 214: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "043" for "display group number 043" in field -2- and confirm entry by pressing -Q- button.

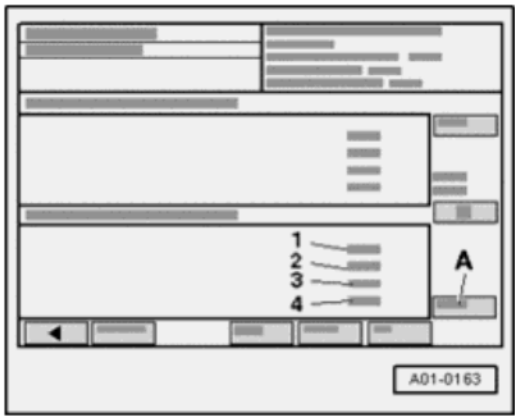

Fig. 215: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Press accelerator and brake pedal simultaneously; engine speed increases to approx. 2300 rpm.

Conditions

- Accelerator and brake pedal pressed simultaneously, engine runs at approx. 2300 rpm.

- Check indication in display group -4-.

	Display fields			
	1	2	3	4
Display group 043: Diagnosis, Oxygen Sensor aging (bank 1, sensor 2)				
Display	xxxx rpm	xxx ° C	x.xxx V	**---**
Display	Engine speed	Exhaust gas temperature	Oxygen Sensor (O2S) voltage, bank 1, sensor 2	Diagnosis status
Range				Test OFF Test ON B1-S2 OK B1-S2 NOK
Specified value	approx. 2300 rpm	Above 350 ° C	0.100...0.950 volts	B1-S2 OK
			If "B1-S2 NOK" is displayed. Refer to steps below	

If specification in display field 4 is not obtained:

- Perform test drive to free oxygen sensor from any possible residues and repeat test.

If specification in display field 4 is not obtained even after a test drive has been performed:

- Replace Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-.

Oxygen Sensor (O2S) heater 1 -Z29- behind Three Way Catalytic Converter (TWC), checking

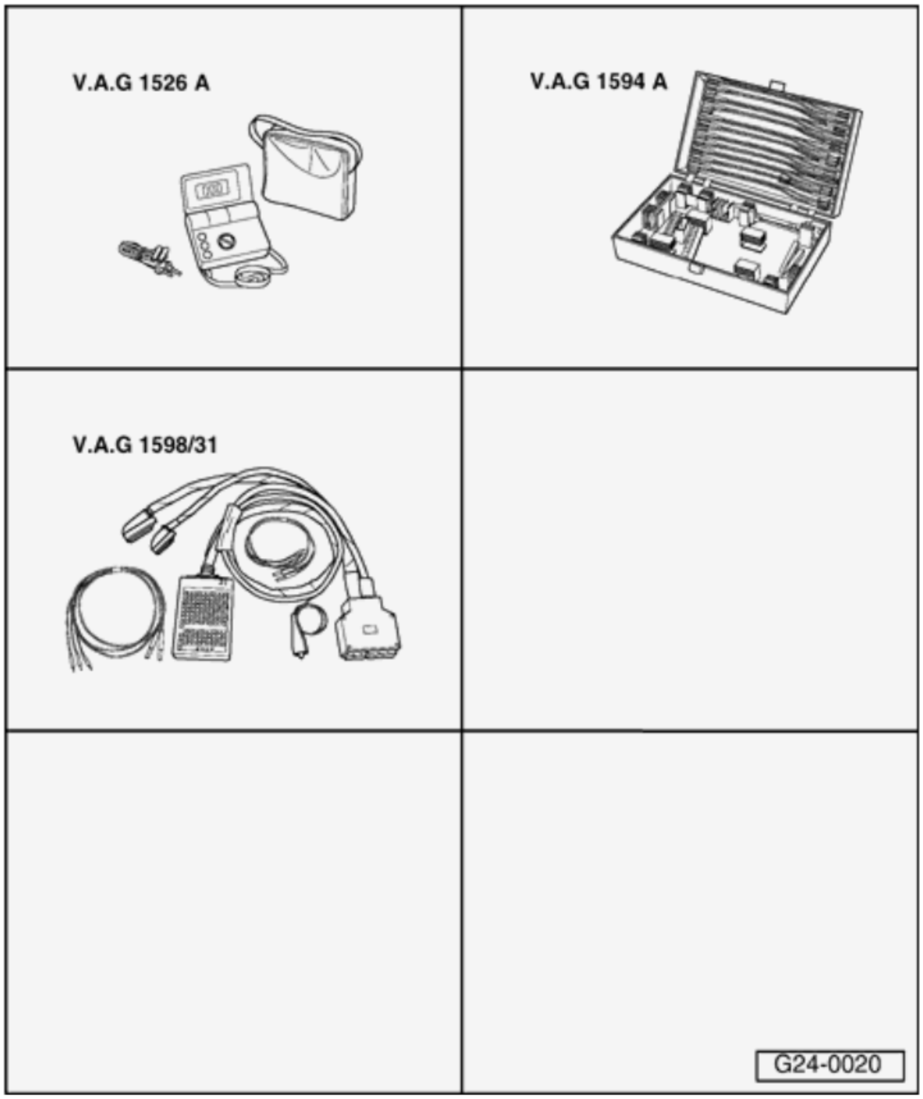

Fig. 216: Identifying Special Tools - Oxygen Sensor (O2S) Heater 1 -Z29- Behind Three Way Catalytic Converter (TWC), Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Text box

Requirements

- Coolant temperature at least 80 ° C.
- Fuse for Oxygen Sensor (O2S) heating OK.

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

Work sequence

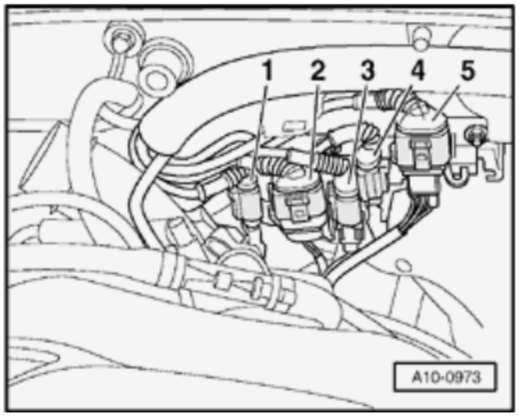

Fig. 217: Identifying Connectors For Oxygen Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect 4-pin connector -2- (brown) to Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-.

NOTE:

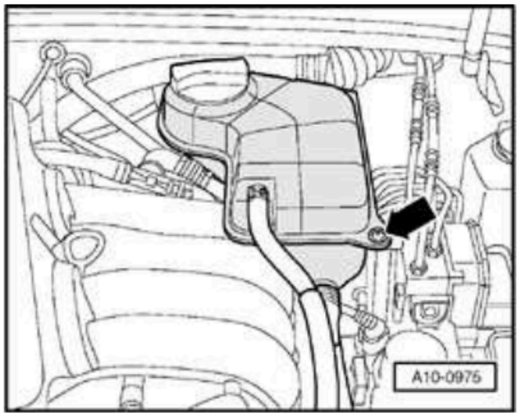

Fig. 218: Removing Coolant Expansion Tank Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

To gain access to the connector, remove coolant expansion tank bolt (arrow) and move expansion tank to side. Fuel hoses remain connected.

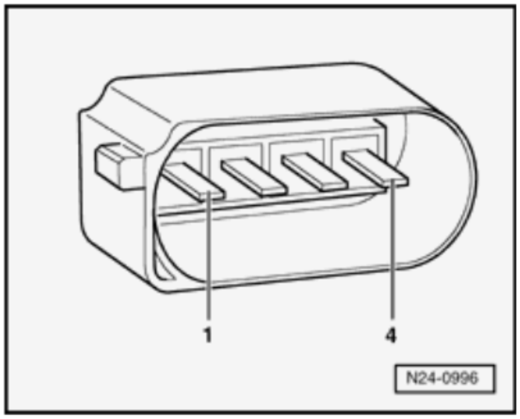

Fig. 219: Identifying 4-Pin Harness Connector Terminals 1 & 4
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter between terminals -1- and -2- to measure resistance.

- Specified value at room temperature 6.4 to 47.5 ohms

If specified value is not obtained:

- Replace Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-.

If specified value is obtained:

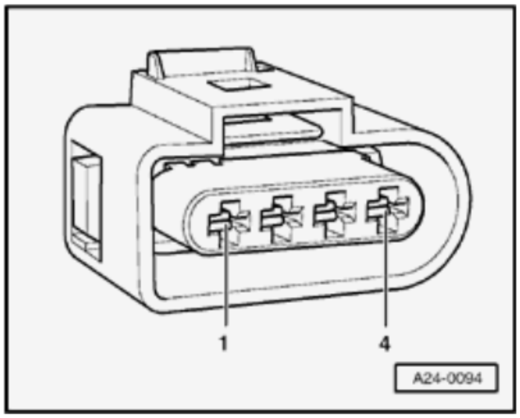

Fig. 220: Identifying Connector Terminals 1 And 4
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter between terminals -1- (B+) and -2- (Ground) to measure voltage.
- Start engine.

- Specified value: approx. battery voltage (B+)

NOTE: **Points at which Oxygen Sensor (O2S) heating is switched on and off by the ECM can be observed in "Reading measured value block" function, display**

group number 041 and display field 4.

If no voltage is present:

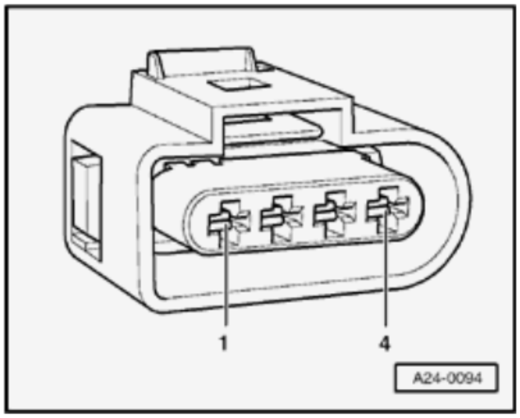

Fig. 221: Identifying Connector Terminals 1 And 4
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter as follows to measure voltage:

Connector Terminal	Measure to
1	Engine ground (GND)

- Operate starter briefly.
- Specified value: approx. battery voltage (B+)

If no voltage is present again:

- Check wire connection from connector terminal 1 via fuse to fuel pump relay for open circuit:

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

If voltage supply is OK:

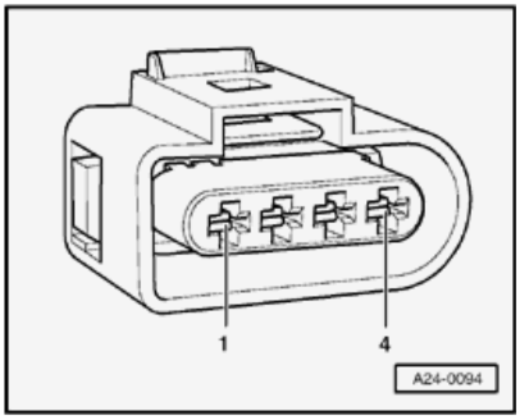

Fig. 222: Identifying Connector Terminals 1 And 4
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter as follows to measure voltage:

Connector Terminal	Measure to
2 (ground activation by ECM)	Battery positive (B+)

- Start engine.

- Specified value: approx. battery voltage (B+), voltage may fluctuate

If no voltage is present:

- Connect test box V.A.G 1598/31 to wiring harness for Engine Control Module (ECM); do not connect to ECM. Refer to **Electrical testing using VAG1598/31 test box**.

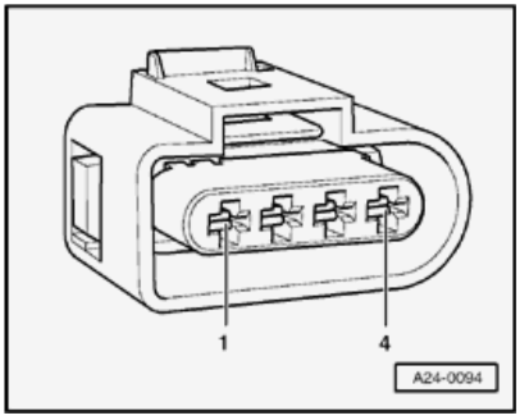

Fig. 223: Identifying Connector Terminals 1 And 4
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check for open circuit in the following wiring connections:

Connector Terminal	Test box V.A.G 1598/31 Socket
2	63

- Repair open circuit, if necessary.

If wiring is OK but there is no ground (GND) supply for the Oxygen Sensor (O2S) heating:

- Replace Engine Control Module (ECM). Refer to **Engine Control Module (ECM) (without metal anti-theft housing), replacing**.

Oxygen Sensor (O2S), removing and installing

Special tools, workshop equipment and other Items required

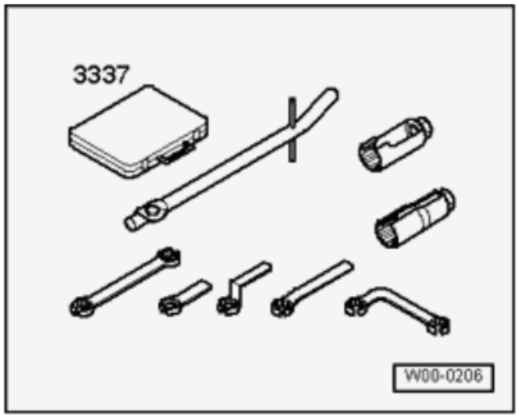

Fig. 224: Identifying Ring Spanner 7-Piece Set 3337
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Box wrench set 3337
- Hot bolt paste G 052 112 A3

Work sequence

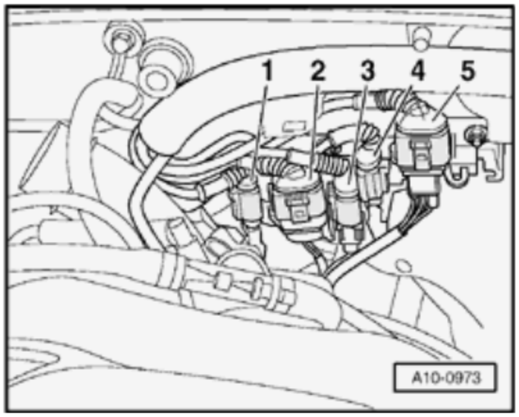

Fig. 225: Identifying Connectors For Oxygen Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connector for oxygen sensor and move wiring clear.

2 - (brown) to Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-

5 - (black) to Heated Oxygen Sensor (HO2S) -G39-

NOTE:

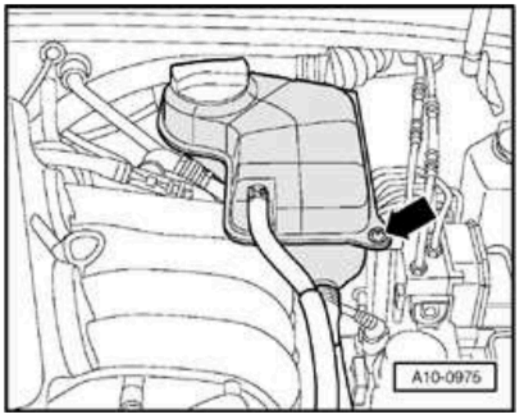

Fig. 226: Removing Coolant Expansion Tank Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

To gain access to the connector, remove coolant expansion tank bolt (arrow) and move expansion tank to side. Fuel hoses remain connected.

- Remove oxygen sensor using special tool 3337.

When installing, note the following points:

NOTE:

- **The screw thread on the oxygen sensor is coated with assembly paste. This paste must not be allowed to penetrate the openings on the sensor.**
- **Tightening torque 55 Nm.**
- **When installing, the oxygen sensor wire must be secured in exactly the same position as before in order to avoid contact between the wire and the exhaust pipe.**

FUEL TANK VENTILATION SYSTEM, CHECKING

Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, checking

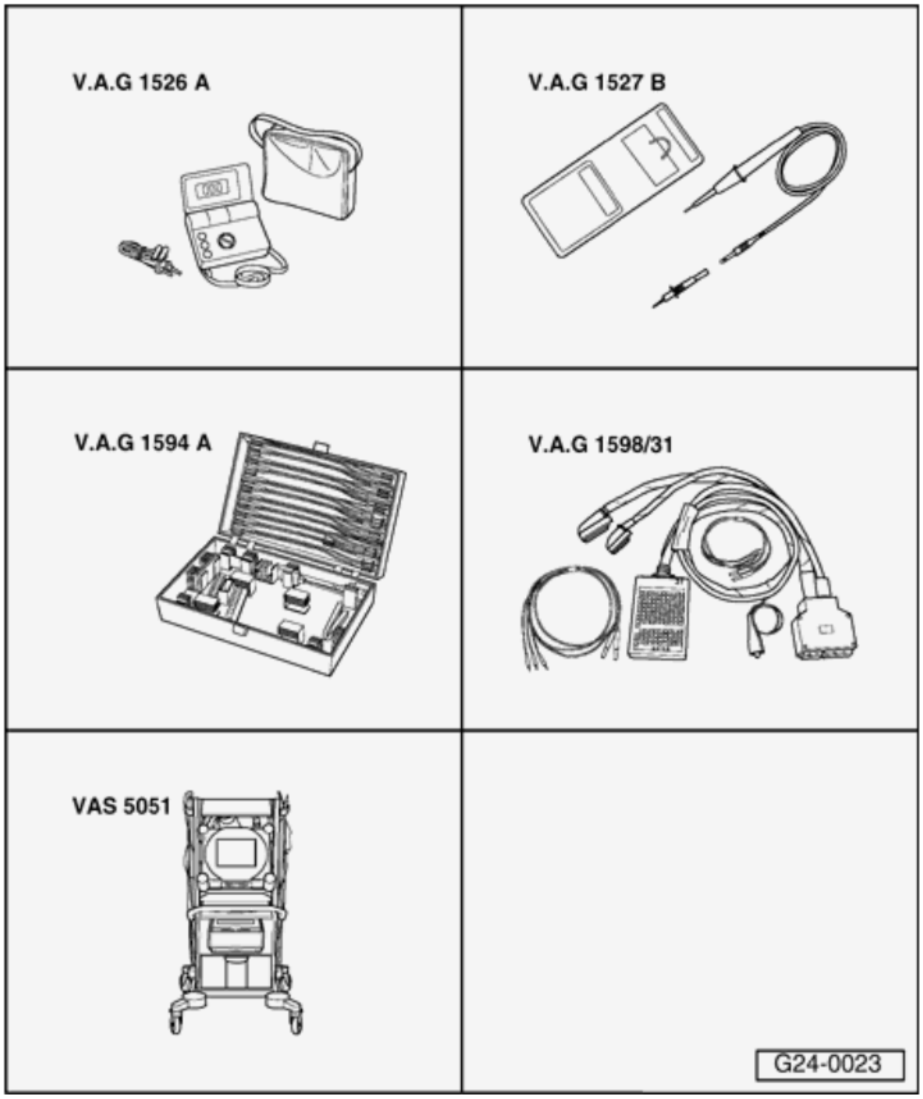

Fig. 227: Identifying Special Tools - Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1527 B LED voltage tester
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Text box

- VAS 5051 Vehicle diagnostic, testing and information system
- VAS 5051/1 Adapter

Checking for leaks

Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- remains closed when de-energized.

- Disconnect hoses from EVAP Canister Purge Regulator Valve -N80- but leave electrical connector connected.
- Connect auxiliary hose to one connection of EVAP Canister Purge Regulator Valve -N80-.
- Connect vehicle diagnostic, testing and information system VAS 5051 or V.A.G 1551 Scan Tool and select engine electronics control module with "Address word" 01. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions**. Ignition must be switched on.
- Initiate output Diagnostic Test Mode (DTM) and activate EVAP Canister Purge Regulator Valve -N80-. Refer to **Output Diagnostic Test Mode (DTM)**.

- The valve should click...
- ..and should open and close (check by blowing into the auxiliary hose).

- End function "03 - Output Diagnostic Test Mode (DTM)" by pressing <-- button

If valve does not open or close properly:

- Replace EVAP Canister Purge Regulator Valve -N80-.

If the fuel injector does not click:

Checking internal resistance

- Disconnect connector on EVAP Canister Purge Regulator Valve -N80-.

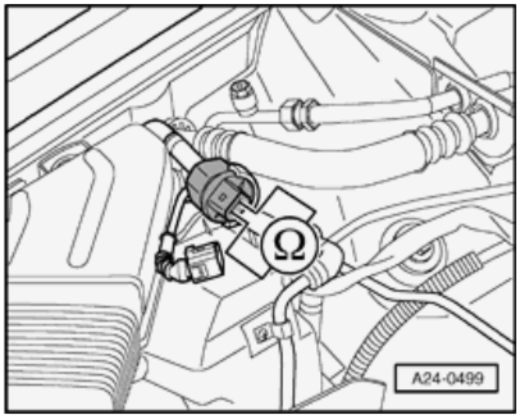

Fig. 228: Measuring Fuel Injector Resistance
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter to fuel injector to measure resistance.

- Specified value: 22 to 30 ohms

If specified value is not obtained:

- ○ Replace EVAP Canister Purge Regulator Valve -N80-.

If specified value is obtained:

Checking power supply

Requirements

- Fuse for Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- OK.

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

- Fuel pump relay OK; checking. Refer to **Fuel Pump (FP) relay -J17- and relay activation, checking**.

NOTE: The EVAP Canister Purge Regulator Valve -N80- receives its power supply via the fuel pump relay.

- ○ Disconnect connector on EVAP Canister Purge Regulator Valve -N80-.

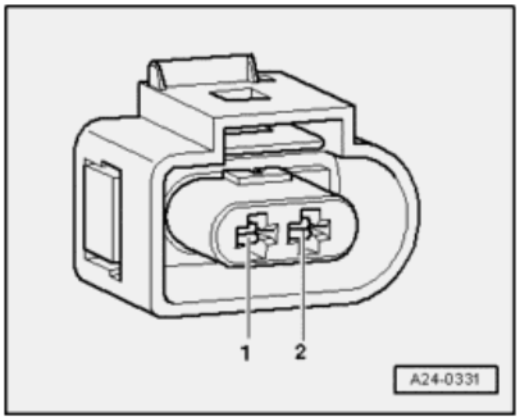

Fig. 229: Identifying 2-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- ○ Connect LED voltage tester V.A.G 1527 B as follows:

Connector Terminal	Measure to
1	Engine ground (GND)

- ○ Operate starter briefly (engine may start).

- LED must light up.

If LED does not light up:

- Check wiring from terminal -1- on connector via fuse to fuel pump relay for an open circuit:

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

- Repair open circuit, if necessary.

If LED lights up:

Checking activation

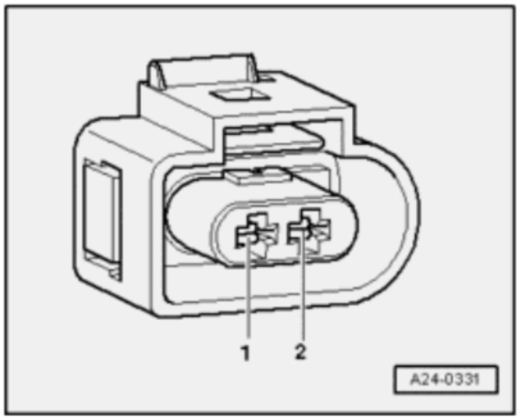

Fig. 230: Identifying 2-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect LED voltage tester V.A.G 1527 B to terminals -1- (positive) and -2- of connector.
- Initiate output Diagnostic Test Mode (DTM) and activate EVAP Canister Purge Regulator Valve -N80-. Refer to **Output Diagnostic Test Mode (DTM)**.

- LED must flash.

If LED lamp does not flash or if it lights up continuously:

- Connect test box V.A.G 1598/31 to wiring harness for Engine Control Module (ECM); do not connect ECM. Refer to **Electrical testing using VAG1598/31 test box**.

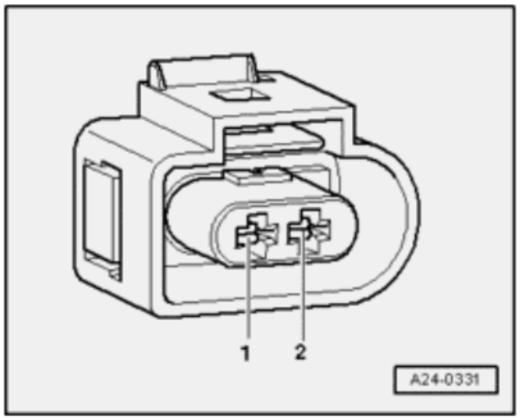

Fig. 231: Identifying 2-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check for open circuit and short to positive (B+) or ground (GND) in following wiring connection:

Connector Terminal	Test box V.A.G 1598/31 Socket
2	64

- Repair any open/short circuit as necessary.

If the wiring is OK:

- Replace Engine Control Module (ECM). Refer to **Engine Control Module (ECM) (without metal anti-theft housing), replacing**.

ELECTRONIC POWER CONTROL (EPC) SYSTEM, CHECKING

EPC system function

In the Electronic Power Control (EPC), the throttle valve is not operated by a cable connected to the accelerator pedal. There is no mechanical connection between the accelerator pedal and the throttle valve.

The position of the accelerator pedal is communicated to the Engine Control Module by two Throttle Position (TP) Sensors (variable resistances located in a single housing) connected to the accelerator pedal.

The position of the accelerator pedal (decided by the driver) is one of the main input parameters to the Engine Control Module (ECM).

The throttle valve is activated, over the full range of engine speed and power, by an electric motor (throttle valve actuator) in the Throttle valve control module -J338-.

The throttle valve actuator moves the throttle valve as instructed by the Engine Control Module (ECM).

With the ignition switched on and the engine not running, the Engine Control Module (ECM) controls the throttle valve precisely in accordance with the signals from the Throttle Position (TP) Sensors. This means that when the accelerator is pressed half way down, the throttle valve actuator opens the throttle valve to an equivalent extent; the throttle valve is then about half open.

When the engine is running (and under load), the Engine Control Module (ECM) can open and close the throttle valve independently of the accelerator position sensors.

As an example, the throttle valve can be fully open even though the accelerator pedal is only pressed half way down. This has the advantage of preventing throttle losses at the throttle valve.

Under certain engine load conditions, markedly improved emission and consumption figures are also obtained.

The engine torque necessary can be provided by the Engine Control Module (ECM) by an optimum combination of throttle opening and charge pressure.

The Electronic Power Control (EPC) system does not simply consist of one or two components but is, rather, a system which includes all the components which contribute to determining the position of the throttle valve and to controlling and monitoring this position. These components include, for example, the Throttle Valve Control Module, the EPC warning lamp, the Engine Control Module (ECM)...

Electronic Power Control (EPC) warning lamp -K132- in instrument cluster

NOTE: **The Electronic Power Control (EPC) warning lamp -K132- is also known as the EPC warning lamp.**

"EPC" is an abbreviation for Electronic Power Control and refers to the Electronic Power Control system.

When the ignition is switched on, the Engine Control Module (ECM) checks all the components of importance to the Electronic Power Control (EPC).

After switching on the ignition the Engine Control Module (ECM) switches on the Electronic Power Control (EPC) warning lamp -K132-. The EPC lamp goes out shortly after starting the engine, if, on the one hand, the Engine Control Module (ECM) does not detect any malfunctions in the EPC system, and, on the other, if activation of the lamp by the Engine Control Module (ECM) is OK.

If a malfunction is detected in the Electronic Power Control (EPC) while the engine is running, the Engine Control Module (ECM) switches on the Electronic Power Control (EPC) warning lamp -K132-. (These DTCs are listed in the DTC table). At the same time, an entry is made in the Engine Control Module DTC memory.

Electronic Power Control (EPC) warning lamp -K132-, checking

Functional check of warning lamp

- ○ Switch ignition on.

- Engine Control Module (ECM) switches on the Electronic Power Control (EPC) warning lamp -K132-.

  - Start engine.

- Shortly after starting the engine the exhaust warning lamp goes out if no malfunction in relation to the EPC is stored in the DTC memory.

NOTE: **The switch-on signal for the warning lamp is transferred via CAN-bus to the instrument cluster by the Engine Control Module. Check the data exchange between Engine Control Module (ECM) and other CAN-bus control modules. Refer to Data exchange, Motronic/ABS (CAN-bus), checking**

Throttle Valve Control Module -J338-, checking

The following components are located in the housing of the Throttle Valve Control Module -J338-.

- Throttle drive (power accelerator activation) -G186-. (This is an electric motor which is activated by the Engine Control Module (ECM). This electric motor opens the throttle valve against the force of a spring).
- Angle sensor 1 for throttle drive (power accelerator activation) -G187-
- Angle sensor 2 for throttle drive (power accelerator activation) -G188-

NOTE:

- **The housing of the Throttle Valve Control Module -J338- must not be opened.**
- **The angle sensors are in the form of potentiometers (variable resistances). They provide the position of the throttle valve to the Engine Control Module (ECM) completely independently of one another.**
- **The potentiometers cannot be adjusted mechanically. The settings are made as part of basic setting (function 04) using the vehicle diagnosis, testing and information system VAS 5051.**

Throttle Valve Control Module -J338-, adapting

The adaptation process enables the Engine Control Module (ECM) to learn the various positions of the throttle valve with the ignition switched on and the engine not running. These positions are stored in the control module. The feedback signal indicating the position of the throttle valve comes from the two throttle drive angle sensors.

If the Throttle Valve Control Module -J338- or the Engine Control Module (ECM) are removed, installed or replaced or if the voltage supply from the Engine Control Module (ECM) is interrupted, adaptation must always be performed.

The learning process (adaptation process) is performed:

- Automatically if the ignition is switched on once for at least 10 seconds without activating the starter or the accelerator pedal and the Engine Control Module (ECM) recognizes "adaptation requirement". In this case, however, it is not obvious whether the adaptation process was successful or not. Adaptation requirement is recognized if stored voltage values from the angle sensors do not coincide with current measured voltage values in a certain tolerance band.

- By initiating the basic setting (Function 04) of display group 060 with ignition switched on.

NOTE: Engine will not start during automatic adaptation.

Special tools and workshop equipment required

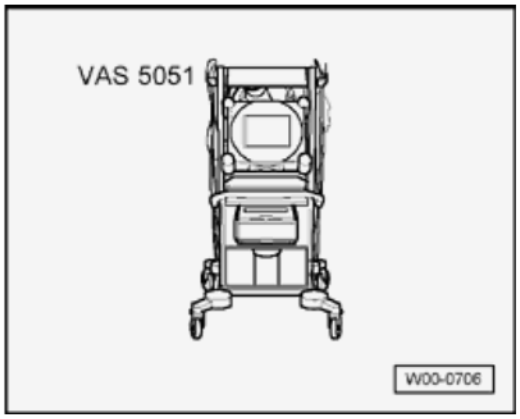

Fig. 232: Identifying Vehicle Diagnosis, Testing And Information System VAS 5051
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAS 5051 Vehicle diagnostic, testing and information system
- VAS 5051/1 adapter

Conditions

- No DTCs recorded in DTC memory; check DTC memory. Refer to **Diagnostic Trouble Code (DTC) memory, checking** .
- Engine stopped, ignition switched on
- Accelerator pedal not depressed.
- Coolant temperature 10 to 95 ° C

- Intake air temperature 10 to 90 ° C
- Voltage supply to Engine Control Module (ECM) greater than 12.7 V, Testing. Refer to **Motronic Engine Control Module (ECM) power supply, checking**.

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection. Ignition must be switched on.

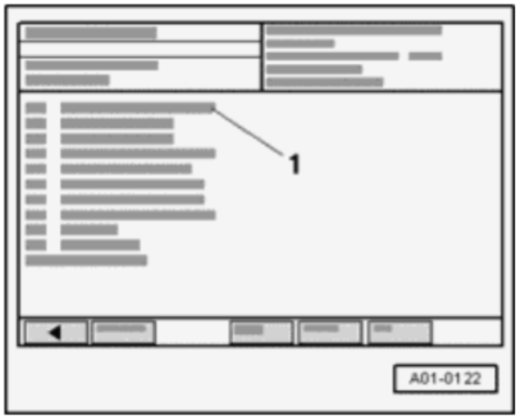

Fig. 233: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "04 - Basic setting".

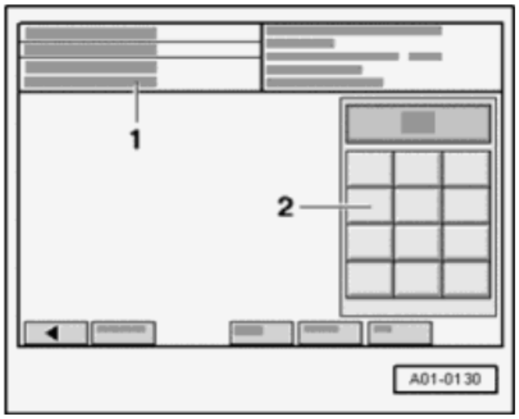

Fig. 234: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "060" for "display group number 060" in field -2- and confirm entry by pressing -Q- button.

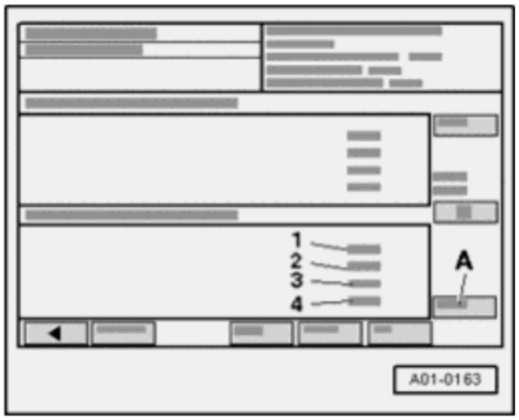

Fig. 235: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.
- Check specifications for Throttle Valve Control Module -J338- in display fields -3- and -4-.

The throttle valve drive is initially connected without voltage present.

In this condition, the throttle valve is pulled into an emergency running position by a mechanical spring which is located in the Throttle Valve Control Module -J338-. The values supplied by the two angle sensors in this emergency running position are stored in the Engine Control Module (ECM).

The throttle valve is then opened by a predetermined amount. When this value is reached, the throttle valve drive is again disconnected from the voltage supply. The mechanical spring should then close the throttle valve to the previously learned emergency running position within a specified period of time (spring test).

The throttle valve drive then closes the throttle valve; the values supplied by the angle sensors in the Throttle Valve Control Module -J338- are stored in the Engine Control Module (ECM).

If the Engine Control Module (ECM) disconnects the throttle valve drive from the voltage supply while the vehicle is being driven, the result will be an increased and fluctuating idling speed and a very poor throttle response.

	Display fields			
	1	2	3	4
Display group 060: Adaptation of throttle valve control module				
Display	xx %	xx %	**x**	**---**
Display	Throttle valve angle (angle sensor 1)	Throttle valve angle (angle sensor 2)	**Adaptation stage counter**	**Adaptation status**
Range			**0...8**	**ADP process running** **ADP OK**

				ERROR
Specified value	3...93%	97...3%	**8**	**ADP OK**
		After adaptation the adaptation stage counter reaches figure 8. (Figures may be skipped)	If "ERROR" is displayed: Check DTC memory. Refer to **Diagnostic Trouble Code (DTC) memory, checking** If specified value is not obtained: Refer to **The control module can abort adaptation for the following reasons:**, Note	

NOTE: "ADP" in display field 4 stands for "Adaptation".

The control module can abort adaptation for the following reasons:

- The throttle valve cannot close completely (e.g. contamination).
- The battery voltage is too low.
- Throttle Valve Control Module -J338- or wire connection is faulty.
- Engine is started during adaptation or accelerator pedal is operated.

- Tension of throttle valve housing (check bolts).

When the adaptation process is interrupted, the message "Function is unknown or cannot be carried out at the moment" is displayed on the tester. The next time the ignition is switched on (for several seconds), the adaptation process is automatically performed again.

- Exit function "04 - Basic setting" by pressing <-- button.

Throttle valve, checking for soiling

Requirements

- An original equipment air filter must be installed and it must be OK.
- Intake air guide OK.
- Fuel pressure OK.
- Tank ventilation OK.

- Fuel injectors OK.
- Coolant temperature > 80 ° C.

- Oxygen sensor adaptation values and control OK. Refer to **Checking oxygen sensor adaptation values and control**.

Work procedure. Refer to **Work sequence**

Checking oxygen sensor adaptation values and control

Work sequence

- Connect VAS5051 tester. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 - Engine electronics". Engine must run at idle during this.

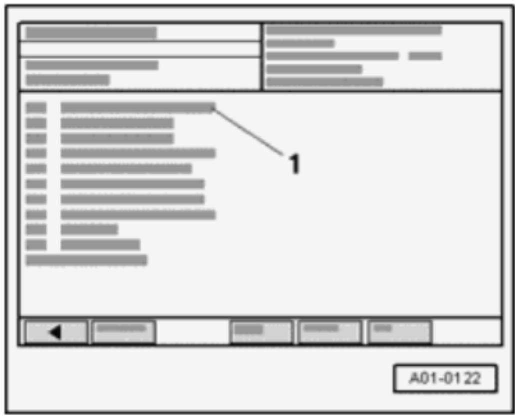

Fig. 236: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS5051:

- In selection -1-, click on the diagnostic function "04 - Basic Setting".

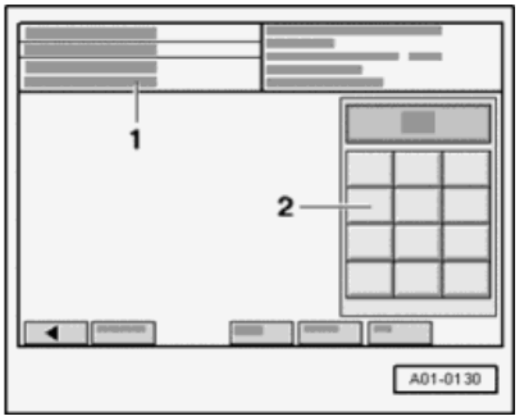

Fig. 237: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS5051:

1 - Enter display group

Max. input value = 255

- Select function "032" in button field -2- for "display group number 032" and press Q button to confirm input.

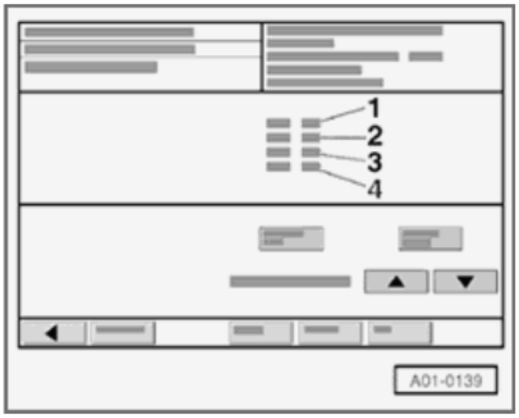

Fig. 238: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS5051:

- Check specified value in display field -2-.

	Display fields			
	1	2	3	4
Display group 032: Oxygen sensor adaptation values				
Display	**xx.x %**	**xx.x %**		
Indicated	**Oxygen sensor adaptation value Bank 1, sensor 1 at idle (additive)**	**Oxygen sensor adaptation value Bank 1, sensor 1 at partial throttle (multiple)**		
Specified value	**-9.0 to 9.0%**	**-25.0 to 25.0%**		

Work sequence

- Disconnect electrical harness connector from Mass Air Flow (MAF) sensor.
- Connect VAS5051 tester. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 - Engine electronics". Engine must run at idle during this.

Requirement

- Engine running at idle select "address word" 01 and "04" the "Initiate Basic Setting" function.

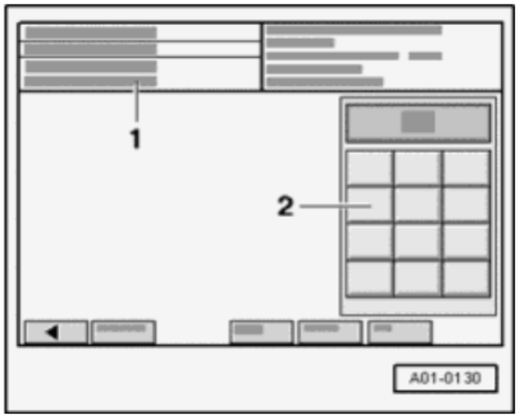

Fig. 239: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS5051:

1 - Enter display group

- Enter "107" in button field -2- for "display group number 107" and press Q button to confirm input.

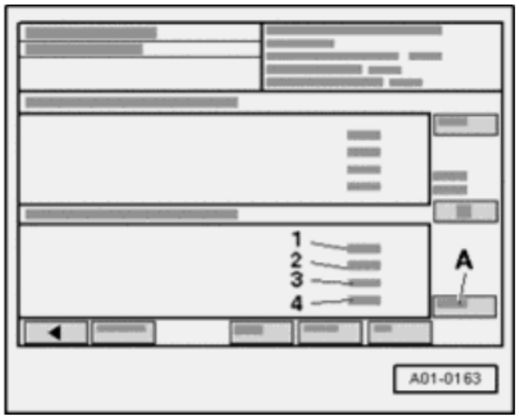

Fig. 240: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS5051:

- Check indication in display field -4-.

	Display fields			
	1	2	3	4
Display group 107: Oxygen sensor control-short trip				
Display	xxx RPM	x.x %	x.x %	**Test ON**

Indicated	Engine speed (actual)	Oxygen sensor control Mean value (Bank 1)	Oxygen sensor control Mean value (Bank 2)	**Diagnostic condition**
Functional range				**Test OFF** **Test ON** **System OK** **System not OK**
Specified value				**System OK**

If specified value "System OK" is obtained in display field 4:

- Click on <-- - button
- Re-connect Mass Air Flow (MAF) sensor.
- For further fault-finding, perform the next test step in the DTC table.

If specified value "System OK" is not obtained in display field 4:

- Click on <-- - button
- Clean air guide in throttle valve control module using a lint-free cloth and methylated spirits.
- Adapt throttle valve control module. Refer to **Throttle Valve Control Module -J338-, adapting**
- Repeat test sequence: Oxygen sensor control-short trip, measuring value block 107 in Basic Setting 04.
- Re-connect Mass Air Flow (MAF) sensor.
- Erase DTC memory. Refer to **Diagnostic Trouble Code (DTC) memory, erasing**.
- Perform a road test. Observe safety precautions. Refer to **Safety precautions**
- DTC memory checked. Refer to **Diagnostic Trouble Code (DTC) memory, checking** .

Throttle valve control module, cleaning

- Clean air guide in throttle valve control module using a lint-free cloth and methylated spirits.
- Adapt throttle valve control module. Refer to **Throttle Valve Control Module -J338-, adapting**
- Erase DTC memory. Refer to **Diagnostic Trouble Code (DTC) memory, erasing**.
- Perform a road test. Observe safety precautions. Refer to **Safety precautions**
- DTC memory checked. Refer to **Diagnostic Trouble Code (DTC) memory, checking** .

Angle sensors for throttle drive -G187- and -G188-, checking

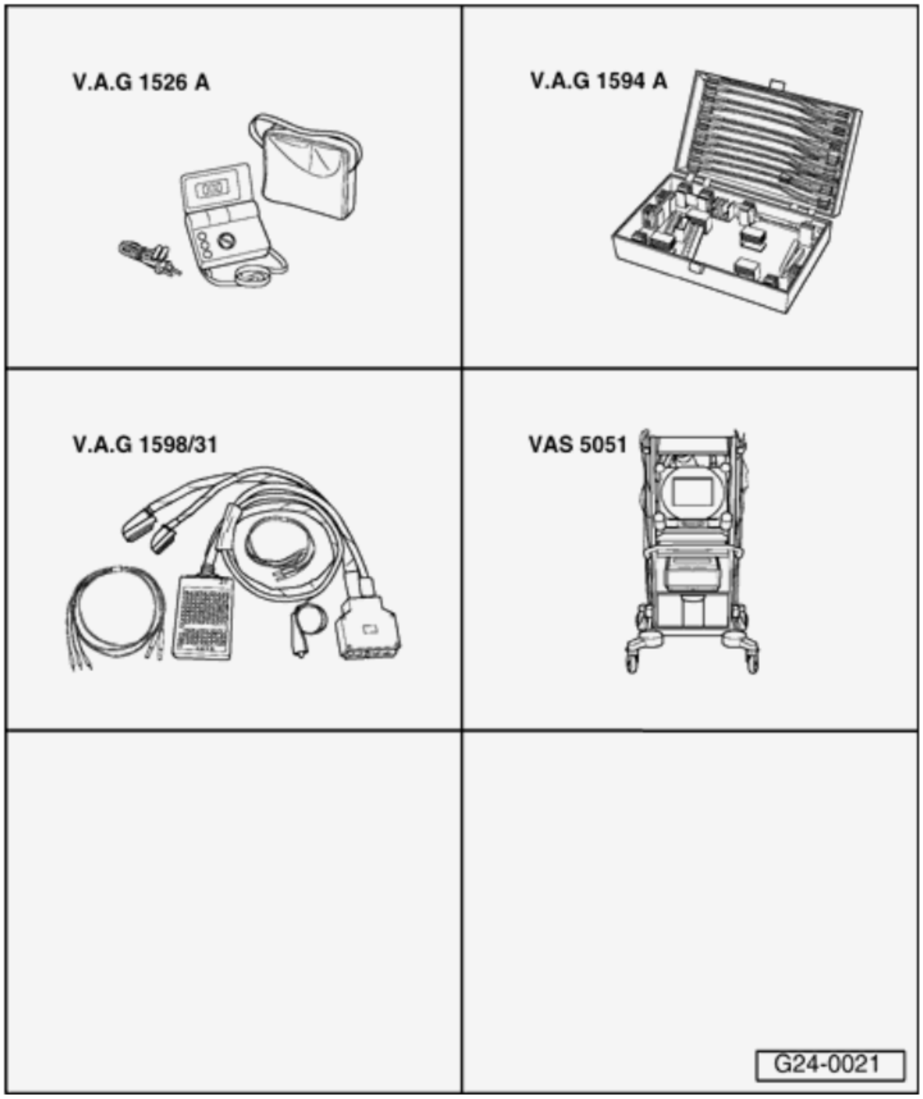

Fig. 241: Identifying Special Tools - Angle Sensors For Throttle Drive -G187- And -G188-, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box
- VAS 5051 Vehicle diagnostic, testing and information system
- VAS 5051/1 adapter

Angle sensor 1 for throttle drive (power accelerator actuation) -G187- and Angle sensor 2 for throttle drive (power accelerator actuation) -G188- inform the Engine Control Module (ECM) about the position of the throttle valve. Both angle sensors are located in the throttle valve control module.

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection. Ignition must be switched on.

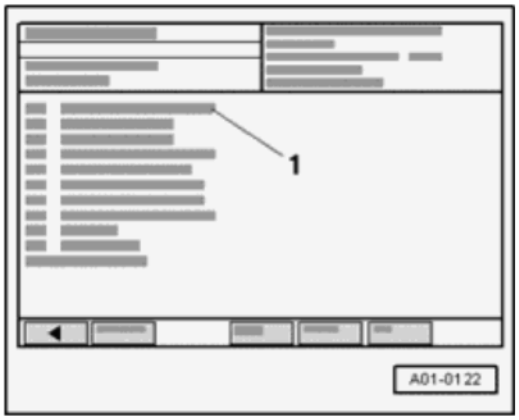

Fig. 242: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "08 - Read measured value block".

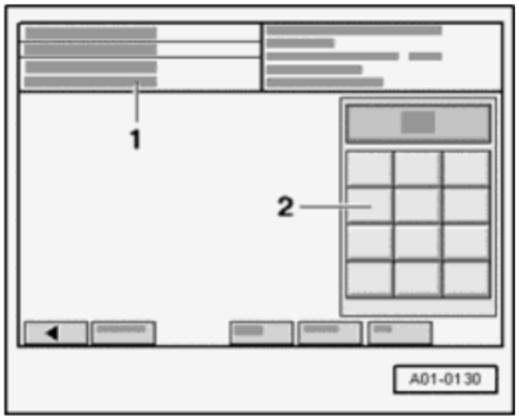

Fig. 243: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "062" for "display group number 062" in field -2- and confirm entry by pressing -Q- button.

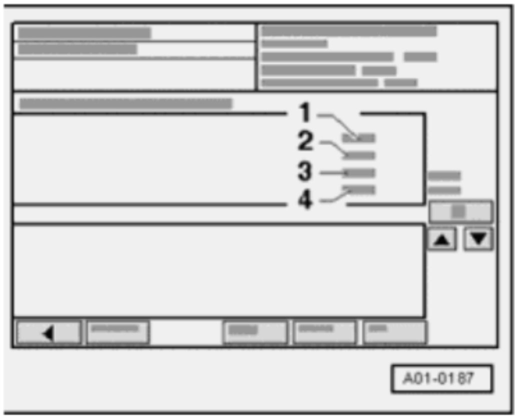

Fig. 244: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Check specifications for electronic throttle potentiometer voltages in display fields -1- and -2-.

	Display fields			
	1	2	3	4
Display group 062: Electronic throttle potentiometer voltages				
Display	**xx %**	**xx %**	xx %	xx %
Display	**Throttle valve angle (angle sensor 1)**	**Throttle valve angle (angle sensor 2)**	Throttle Position Sensor 1	Throttle Position Sensor 2
Specified value	**3...93%**	**97...3%**	12...97%	4...49%

NOTE: **The Engine Control Module (ECM) converts and displays the voltage readings from the angle sensors as percentages of 5 V. (A 5 Volt supply corresponds to 100%).**

- Observe readouts in display fields 1 and 2.
- Slowly depress accelerator pedal.

Percentage displayed in field 1 should rise evenly. Tolerance range from 3..0.93% is not fully utilized.

Percentage displayed in field 2 should fall evenly. Tolerance range from 97..0.3% is not fully utilized.

NOTE:

- **The reason why the value indicated in display field 1 climbs, while the value indicated in display field 2 decreases, has to do with the fact that the potentiometers (angle sensors) in the Throttle Valve Control Module -J338- run in opposite directions.**
- **This means that the voltage of angle sensor 1 runs from 0 to 5 volts. (The more the throttle valve is opened, the larger the voltage; percent indication**

climbs).

- **The voltage of angle sensor 2 runs from 5 to 0 volts. (The more the throttle valve is opened, the lower the voltage; the percentage decreases).**

- Exit function "08 - Read measured value block" by pressing <-- button.

If the displays are not as described:

- Check Throttle Valve Control Module -J338- voltage supply and wiring. Refer to **Checking voltage supply to Throttle Valve Control Module -J338-**. Pay particular attention to connectors, which may be disconnected or corroded.
- Check Sender -2- for accelerator pedal position -G185-. Refer to **Throttle Position (TP) sensor 1 -G79- and Sender -2- for accelerator pedal position -G185-, checking**.

Checking voltage supply to Throttle Valve Control Module -J338-

- Disconnect connector from Throttle Valve Control Module -J338-.
- Switch ignition on.

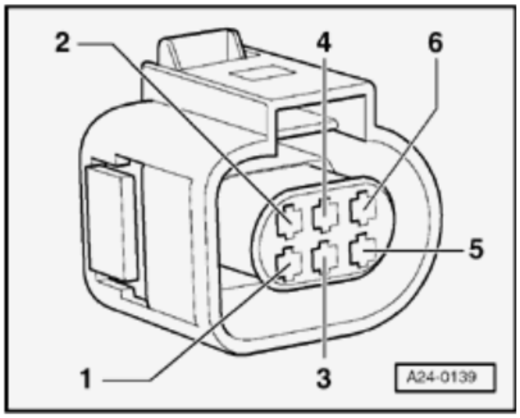

Fig. 245: Identifying 6-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter as follows to measure voltage:

Connector Terminal	Specified value
2 + ground (GND)	approx. 5 V
2 + 6	approx. 5 V

If specified values are not obtained:

Checking wiring connections

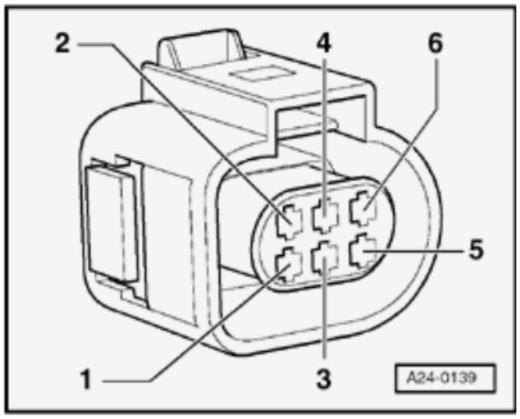

Fig. 246: Identifying 6-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connector from Throttle Valve Control Module -J338-.
- Connect test box V.A.G 1598/31 to wiring harness for Engine Control Module (ECM); do not connect Engine Control Module (ECM). Refer to **Electrical testing using VAG1598/31 test box**.
- Check for open circuit, short to ground (GND), or short to positive (B+) in following wiring connections:

Connector Terminal	Test box V.A.G 1598/31 Socket
1	92
2	83
3	117
4	84
5	118
6	91

- Repair any open/short circuit as necessary.

If no malfunctions are found in wires:

- Replace Throttle Valve Control Module -J338-.

Throttle Position (TP) sensor 1 -G79- and Sender for accelerator pedal position -G185-, checking

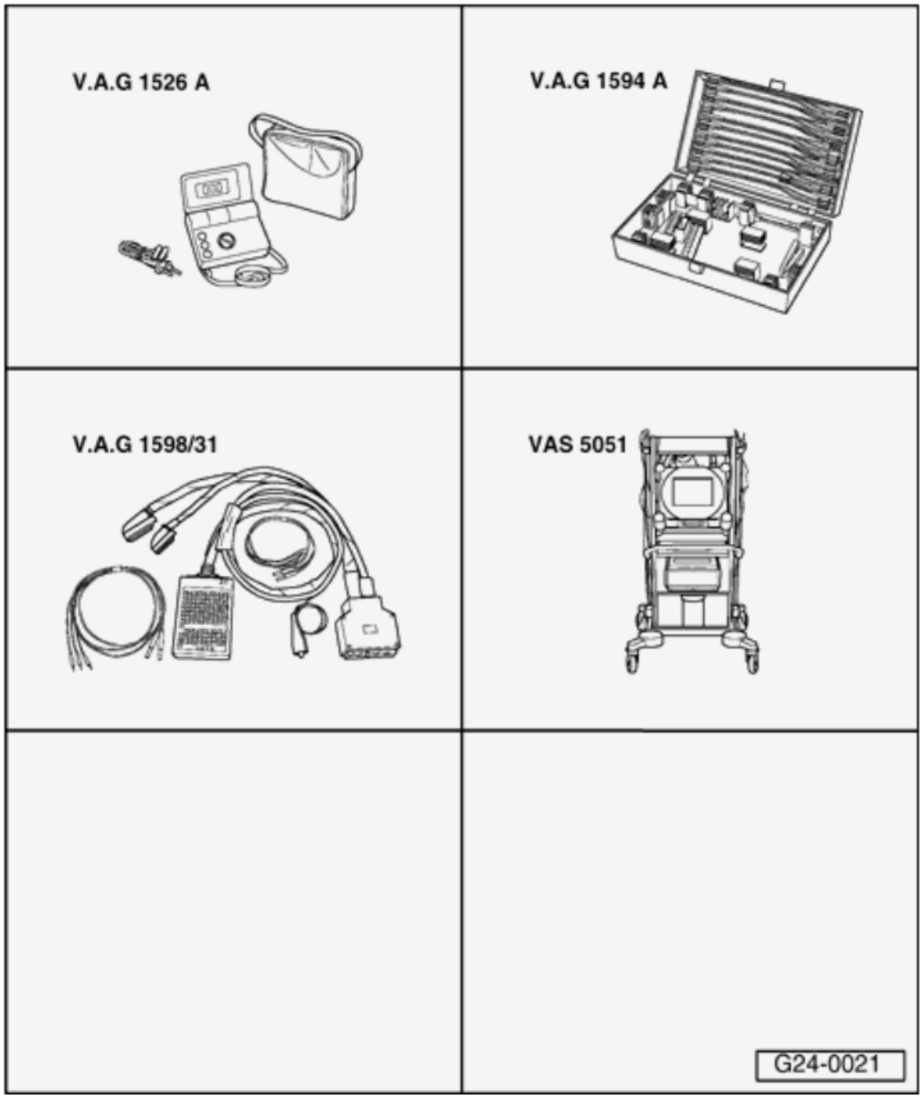

Fig. 247: Identifying Special Tools - Throttle Position (TP) Sensor 1 -G79- And Sender For Accelerator Pedal Position -G185-, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box
- VAS 5051 Vehicle diagnostic, testing and information system
- VAS 5051/1 Adapter

Both the Throttle Position (TP) sensor 1 -G79- and the Sender -2- for accelerator pedal position -G185- are located at the accelerator pedal and communicate the driver's intentions to the ECM completely independently of each other. Both sensors are stored in one housing.

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection.

When doing this the ignition must be switched on.

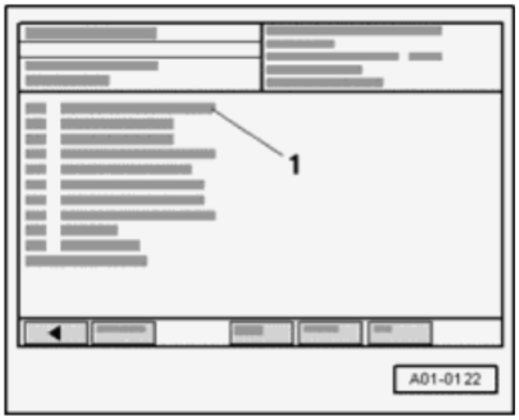

Fig. 248: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "08 - Read measured value block".

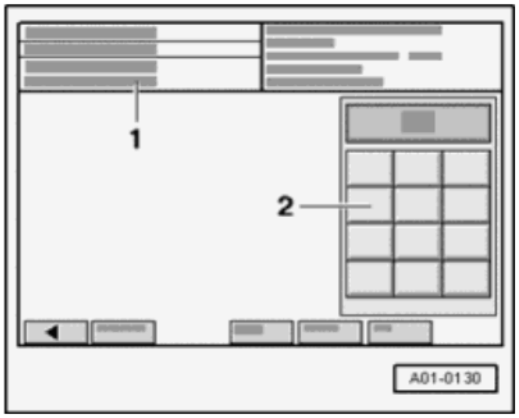

Fig. 249: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "062" for "display group number 062" in field -2- and confirm entry by pressing -Q- button.

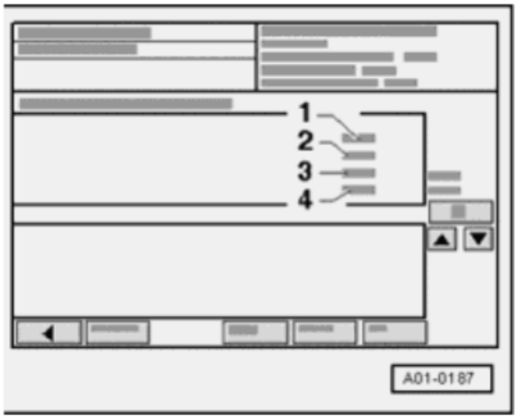

Fig. 250: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Check indication in display groups -3-and -4-.

	Display fields			
	1	2	3	4
Display group 062: Electronic throttle potentiometer voltages				
Display	xx %	xx %	**xx %**	**xx %**
Display	Throttle valve angle (angle sensor 1)	Throttle valve angle (angle sensor 2)	**Throttle position sensor 1**	**Throttle position sensor 2**
Specified value	3...93%	97...3%	**12...97%**	**4...49%**

NOTE: The Engine Control Module (ECM) converts and displays the voltage readings from the angle sensors as percentages of 5 V. (A 5 Volt supply corresponds to 100%).

- Observe readouts in display fields 3 and 4.
- Slowly depress accelerator pedal.

Percentage displayed in field 3 should rise evenly. Tolerance range from 12..0.97% is not fully utilized.

Percentage displayed in field 4 should also rise evenly. Tolerance range from 4...49% is not fully utilized.

NOTE: The value displayed in field 3 must always be about twice as large as that in field 4.

- Exit function "08 - Read measured value block" by pressing <-- button.

If the displays are not as described:

- Check Sender -2- for accelerator pedal position -G185- voltage supply and wiring. Refer to **Voltage supply for Throttle Position (TP) sensor -G79- and Sender -2- for accelerator pedal position -G185-, checking**.

Voltage supply for Throttle Position (TP) sensor -G79- and Sender -2- for accelerator pedal position -G185-, checking

- Remove driver's storage compartment:

Refer to

- **68 - INTERIOR EQUIPMENT**
- **68 - INTERIOR EQUIPMENT** for BODY INTERIOR - CABRIOLET

; Instrument panel; removing driver-side storage compartment

- Disconnect connector for throttle position sensors.
- Switch ignition on.

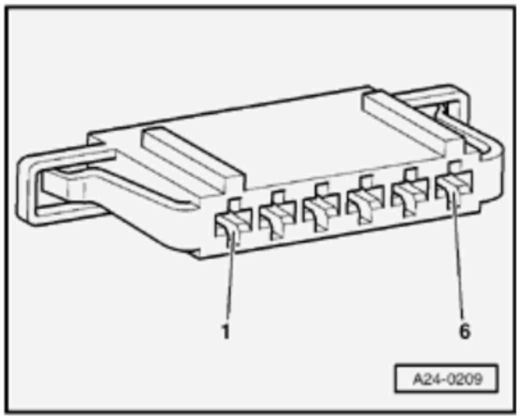

Fig. 251: Accelerator Pedal Position Sensor Harness Connector Terminals 1 And 6
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter as follows to measure voltage:

Connector Terminal	Specified value
1 + ground (GND)	approx. 5 V
1 + 5	approx. 5 V
2 + ground (GND)	approx. 5 V
2 + 3	approx. 5 V

If specifications are obtained:

- Additionally check signal wires.

If the specified values are not obtained:

Check wiring

- Connect test box V.A.G 1598/31 to wiring harness for Engine Control Module; do not connect Engine Control Module. Refer to **Electrical testing using VAG1598/31 test box**.

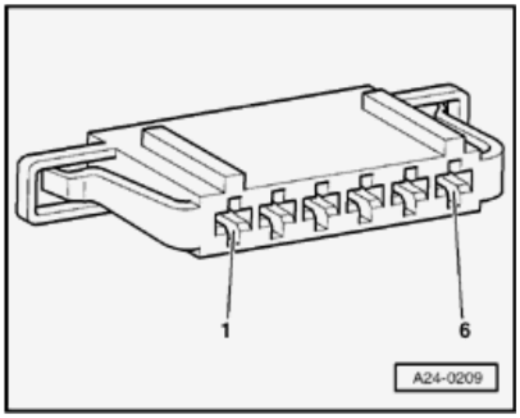

Fig. 252: Accelerator Pedal Position Sensor Harness Connector Terminals 1 And 6
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check for open circuit and short to positive (B+) or ground (GND) in following wiring connection:

Connector Terminal	Test box V.A.G 1598/31 Socket
1	72
2	73
3	36
4	35
5	33
6	34

- Repair any open/short circuit as necessary.

If no malfunction is found in wires:

- Replace throttle position sensor(s).

Refer to **20 - FUEL SUPPLY SYSTEM**

Kick-down function, adapting

If Sender -2- for accelerator pedal position -G185- or Engine Control Module (ECM) is replaced kick-down function must be adapted on vehicles with automatic transmission.

Special tools and workshop equipment required

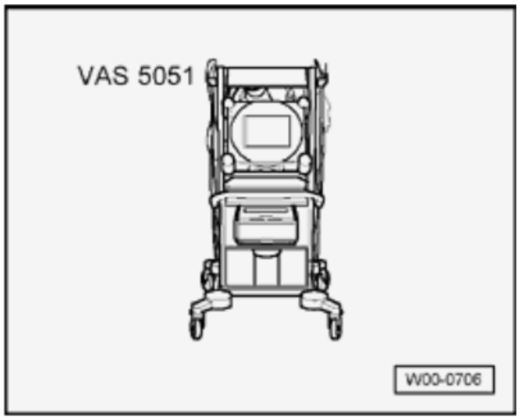

Fig. 253: Identifying Vehicle Diagnosis, Testing And Information System VAS 5051
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAS 5051 Vehicle diagnostic, testing and information system
- VAS 5051/1 Adapter

Conditions

- No DTCs recorded in DTC memory; check DTC memory. Refer to **Diagnostic Trouble Code (DTC) memory, checking** .
- Engine stopped, ignition switched on

Work sequence

- Connect VAS 5051 scan tool. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection.

When doing this the ignition must be switched on.

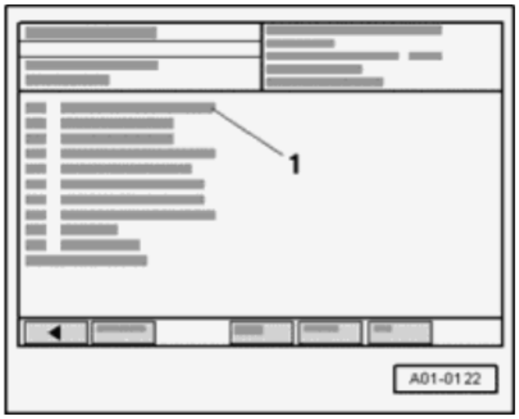

Fig. 254: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051 scan tool:

- Under -1- select diagnostic function "04 - Basic setting".

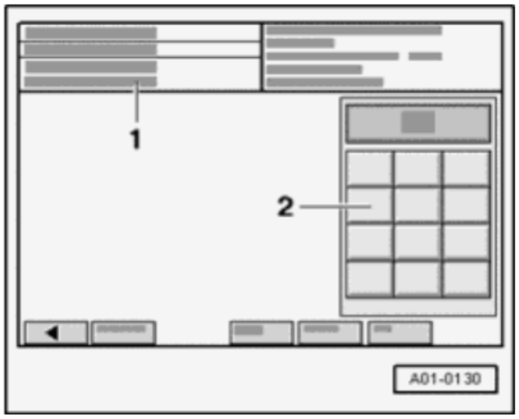

Fig. 255: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "063" for "display group number 063" in field -2- and confirm entry by pressing -Q- button.

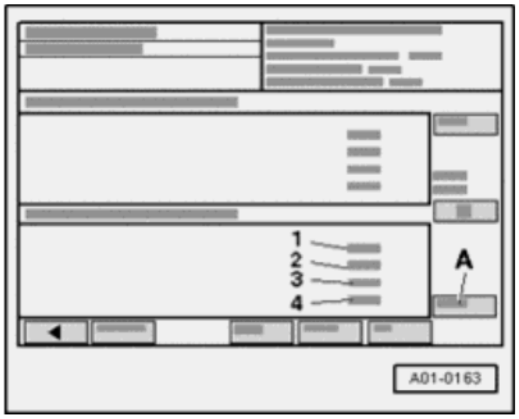

Fig. 256: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Activate basic setting by pressing -A- button.

NOTE: There will be a prompt: "Activate kick-down".

- Depress accelerator pedal completely, past kick-down point, and hold down.

NOTE: **During the kick-down point adaptation process, "Kick-down ADP running" is shown on the display. After successful adaptation of the kickdown point "Kick-down ADP OK" appears on the display.**

- Check indication in display field -4-.

All models

	Display fields			
	1	2	3	4
Display group 063: Adapting kick-down function				
Display	xx %	xx %	**Kick-down**	**---**
Display	Throttle Position sensor 1	Adapted kick-down value for Throttle Position sensor 1	**Kick-down**	**Adaptation status**
Range			**Kick-down**	**Starting** **ADP process running** **ADP OK** **ERROR**
Specified value	79...94%	79...94%	**Kick-down**	**ADP OK**
			If "ERROR" is displayed: Check DTC memory. Refer to **Diagnostic Trouble Code (DTC) memory, checking**	

NOTE:

- **"ADP" in display field 4 stands for adaptation.**
- **"ERROR" may be displayed, if accelerator pedal is not pressed immediately when instructed by tester, or if accelerator pedal was released while adaptation was already running but process was not yet complete. In both cases exit "basic setting" mode and carry out adaptation again. Refer to Kick-down function, adapting.**

Brake Light Switch -F- and Brake Pedal Switch -F47-

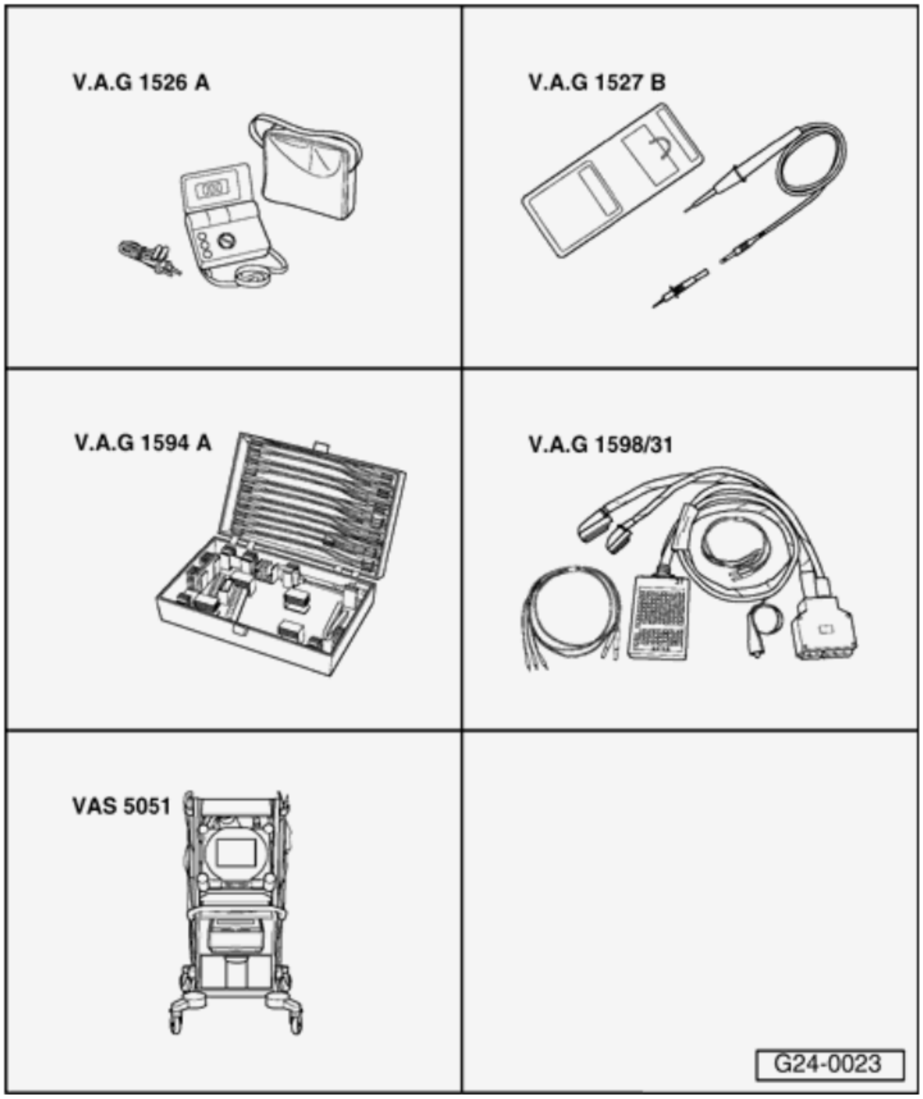

Fig. 257: Identifying Special Tools - Brake Light Switch -F- And Brake Pedal Switch -F47-
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1527 B LED voltage tester
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box

- VAS 5051 Vehicle diagnostic, testing and information system
- VAS 5051/1 Adapter

NOTE: **Command from Sender -2- for accelerator pedal position -G185- (potentiometer) to Engine Control Module (ECM) for opening throttle valve is suppressed for**

safety reasons when brake is pressed. To do so the brake light signal and also the Brake Pedal Switch -F47- signal are required in the ECM. If the brakes are operated when the accelerator pedal is held at a constant position the engine is immediately reduced to idling speed. Incorrectly adjusted switches may lead to unwanted regulating actions.

Work sequence

- Connect VAS 5051 scan tool. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection.

When doing this the ignition must be switched on.

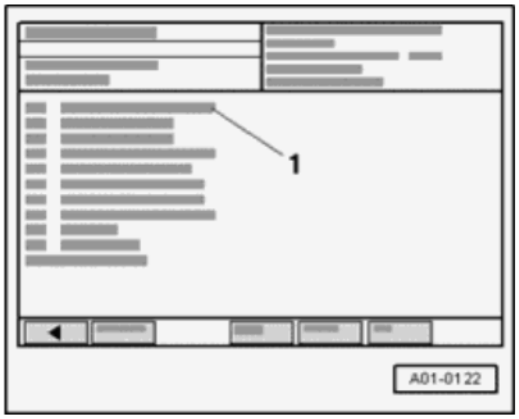

Fig. 258: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "08 - Read measured value block".

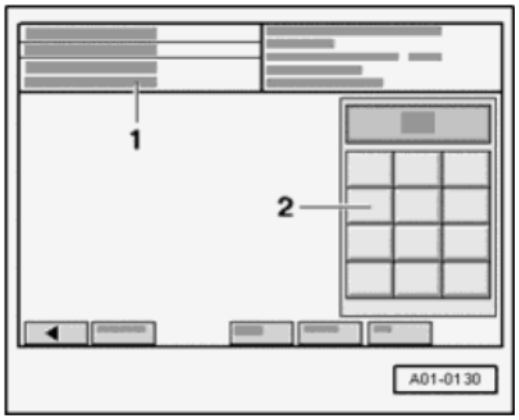

Fig. 259: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051 scan tool:

1 - Enter display group

- Enter "066" for "display group number 066" in field -2- and confirm entry by pressing -Q- button.

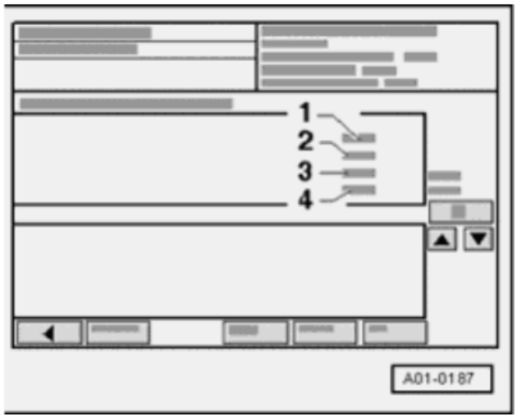

Fig. 260: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051 scan tool:

- Check Brake Light Switch -F-/Brake Pedal Switch -F47- in display field -2-.

	Display fields			
	1	2	3	4
Display group 066: Signals to Engine Control Module (ECM)				
Display	xxx km/h	**XXXXXXXX**	xxx km/h	XXXXXXXX
Display	ACTUAL speed	**Switch settings**	SPECIFIED speed	Switch settings
Range		**0 = off** **1 = on**		
Specified value		**XXXXXX00 (if brake pedal not pressed)**		
		XXXXXX11 (if brake pedal pressed)		
	Value: X = no meaning. Switching points are slightly offset			

- Exit function "08 - Read measured value block" by pressing <-- button.

If the display is not as described:

Check switch

- Remove driver's storage compartment:

Refer to

- **68 - INTERIOR EQUIPMENT**
- **68 - INTERIOR EQUIPMENT** for BODY INTERIOR - CABRIOLET

; Instrument panel; removing driver-side storage compartment

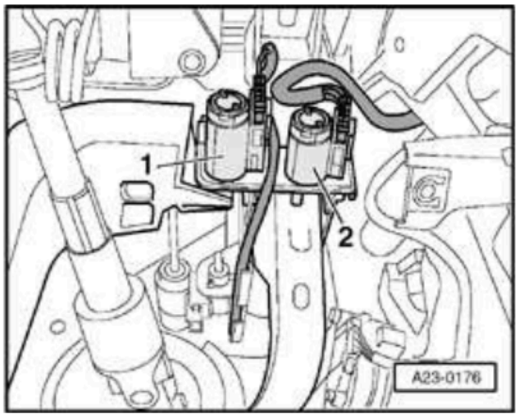

Fig. 261: Installed Location Brake Light Switch F And Brake Pedal Switch F47 , Clutch Pedal Switch F36
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connector from Brake Light Switch -F-/Brake Pedal Switch -F47- -2-.

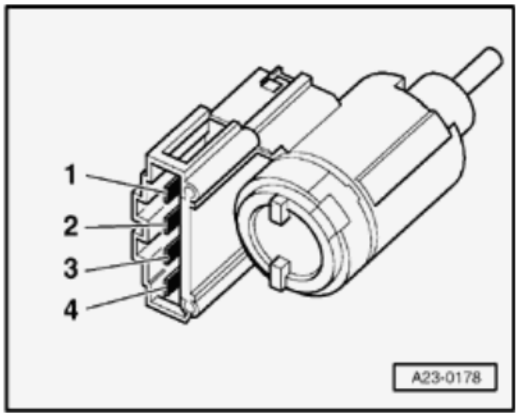

Fig. 262: Identifying Brake Light Switch & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter between terminals 1 and 4 to measure resistance.

- Specified value: infinity ohms (no continuity)

- ○ Press brake pedal.
- Specified value: approx. 0 ohms
- ○ Connect multimeter between terminals 2 and 3 to measure resistance.
- Specified value: approx. 0 ohms
- ○ Press brake pedal.
- Specified value: infinity ohms (no continuity)

If the specified values are not obtained:

- ○ Replace Brake Light Switch -F-/Brake Pedal Switch -F47-.

Refer to **46 - BRAKES - MECHANICAL COMPONENTS**

If specifications are obtained:

Check power supply

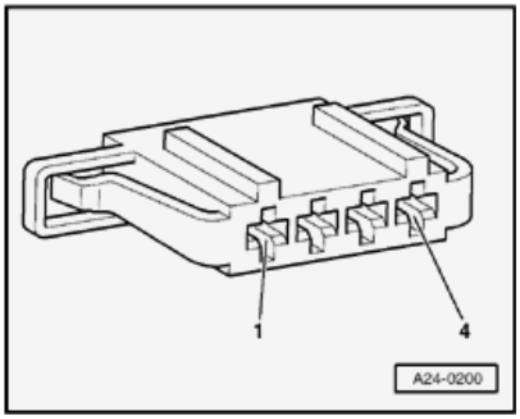

Fig. 263: Identifying 4-Pin Clutch Pedal Switch Terminals 1 & 2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- ○ Connect voltage tester V.A.G 1527 B as follows:

Connector Terminal	Measure to
1	Vehicle body ground (GND) point

- LED must light up.

Connector	Measure to

Terminal	
3	Vehicle body ground (GND) point

- Switch ignition on.
- LED must light up.

If LED does not light up:

- Check wiring for open circuit and repair if needed.

If LED lights up:

Check activation

- Connect test box V.A.G 1598/31 to wiring harness for Engine Control Module (ECM); do not connect Engine Control Module (ECM). Refer to **Electrical testing using VAG1598/31 test box**.

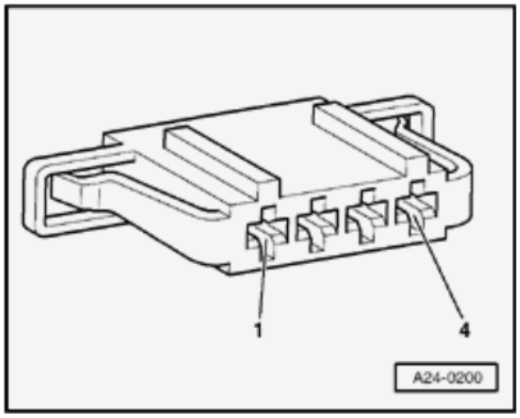

Fig. 264: Identifying 4-Pin Clutch Pedal Switch Terminals 1 & 2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check for open circuit and short to positive or ground (GND) in following wiring connections:

Connector Terminal	Test box V.A.G 1598/31 Socket
2	55
4	56

- Repair any open/short circuit as needed.

Clutch Vacuum Vent Valve Switch -F36-, checking

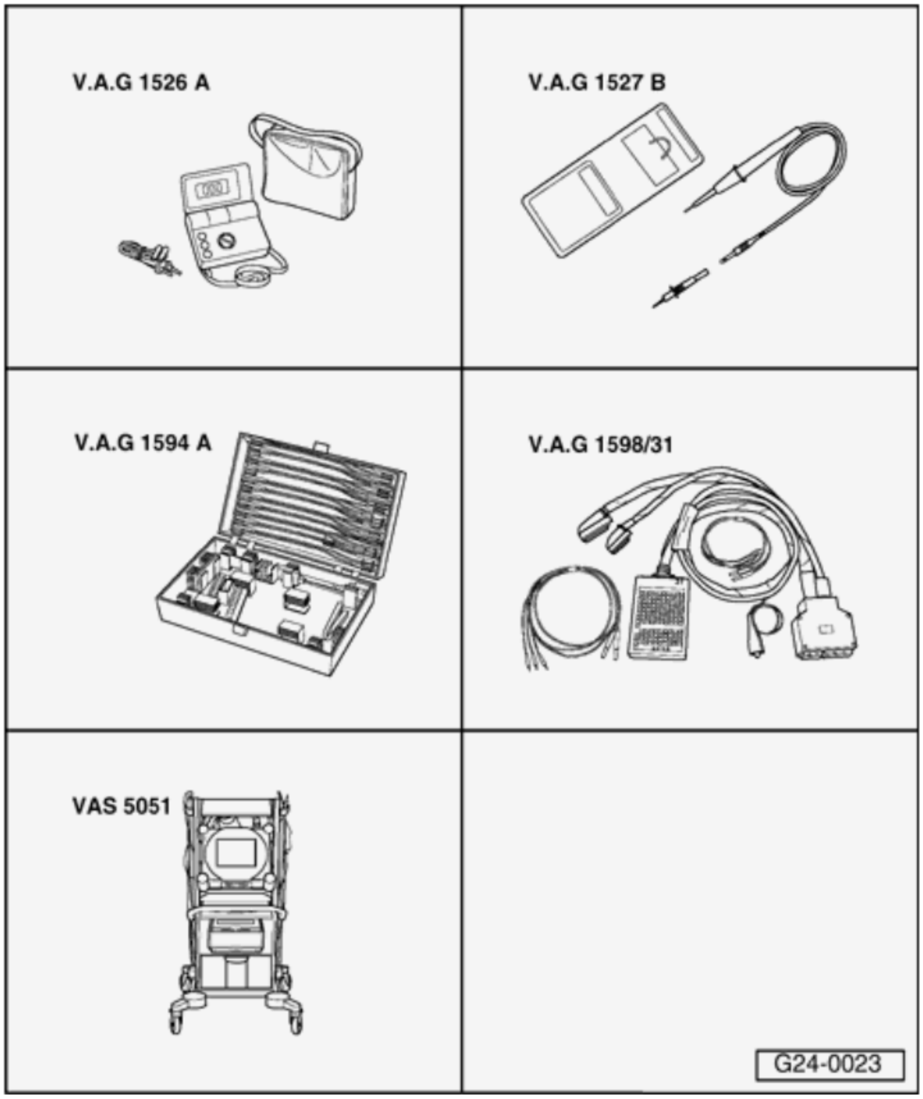

Fig. 265: Identifying Special Tools - Clutch Vacuum Vent Valve Switch -F36-, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1527 B LED voltage tester
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box

- VAS 5051 Vehicle diagnostic, testing and information system
- VAS 5051/1 Adapter

NOTE: This signal helps prevent excessive RPM oscillations and tip-in shocks when clutch is disengaged and is required for the cruise control system.

Work sequence

- Connect VAS 5051 scan tool. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection.

When doing this the ignition must be switched on.

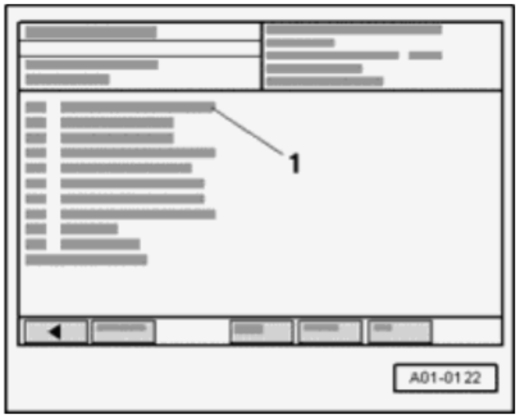

Fig. 266: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051 scan tool:

- Under -1- select diagnostic function "08 - Read measured value block".

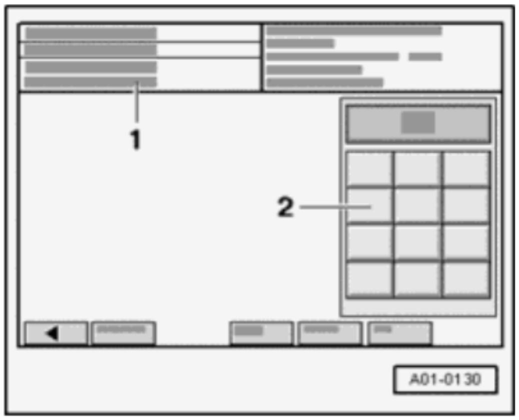

Fig. 267: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "066" for "display group number 066" in field -2- and confirm entry by pressing -Q- button.

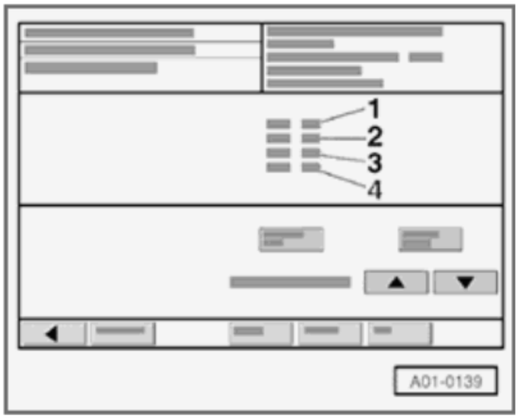

Fig. 268: Diagnostic System VAS 5051: Display - Display Fields
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Check indication in display field -2-.

	Display fields			
	1	2	3	4
Display group 066: Signals to Engine Control Module (ECM)				
Display	xxx km/h	**XXXXXXXX**	xxx km/h	XXXXXXXX
Display	ACTUAL speed	**Switch settings**	SPECIFIED speed	Switch settings
Range		**0 = off** **1 = on**		
Specified value		**XXXXX0XX (if brake pedal not pressed)**		
		XXXXX1XX (if brake pedal pressed)		
	Value: X = no meaning.			

- Exit function "08 - Read measured value block" by pressing <-- button.

If indications do not resemble description:

Checking switch

- Remove driver's storage compartment:

Refer to

- **68 - INTERIOR EQUIPMENT**

- **68 - INTERIOR EQUIPMENT** for BODY INTERIOR - CABRIOLET

; Instrument panel; Driver-side storage compartment, removing

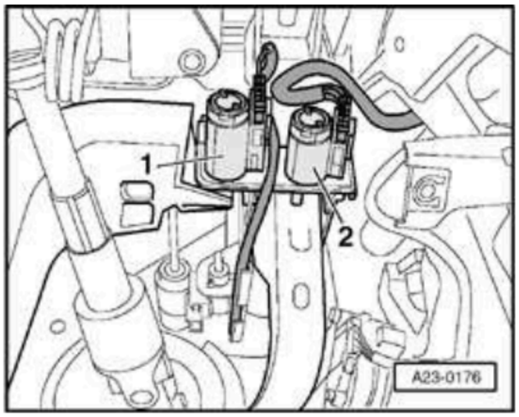

Fig. 269: Installed Location Brake Light Switch F And Brake Pedal Switch F47 , Clutch Pedal Switch F36
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect connector from Clutch Vacuum Vent Valve Switch -F36-.

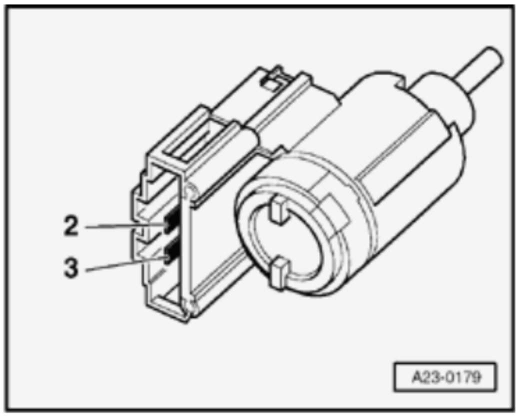

Fig. 270: Identifying Clutch Vacuum Vent Valve Switch -F36- Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter between terminals 2 and 3 to measure resistance.

- Specified value: approx. 0 ohms

- Operate clutch pedal.

- Specified value: infinity ohms (no continuity)

If specified value is not obtained:

- Replace Clutch Vacuum Vent Valve Switch -F36-.

If specified value is obtained:

Checking voltage supply

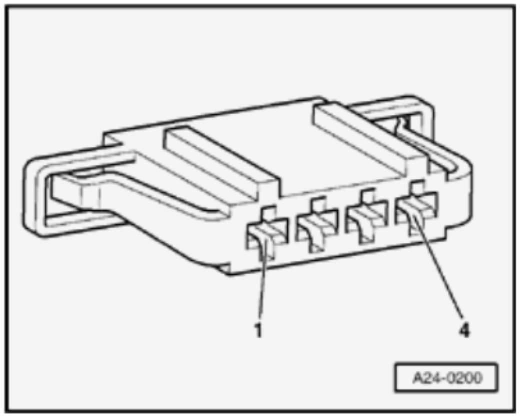

Fig. 271: Identifying 4-Pin Clutch Pedal Switch Terminals 1 & 2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect voltage tester V.A.G 1527 B as follows:

Connector Terminal	Measure to
3	Vehicle body ground (GND) point

- Switch ignition on.

- LED must light up.

If LED does not light up:

- Check wiring for open circuit and service if necessary.

If LED lights up:

Checking activation

- Connect test box V.A.G 1598/31 to wiring harness for Engine Control Module (ECM); do not connect directly to ECM. Refer to **Electrical testing using VAG1598/31 test box**.

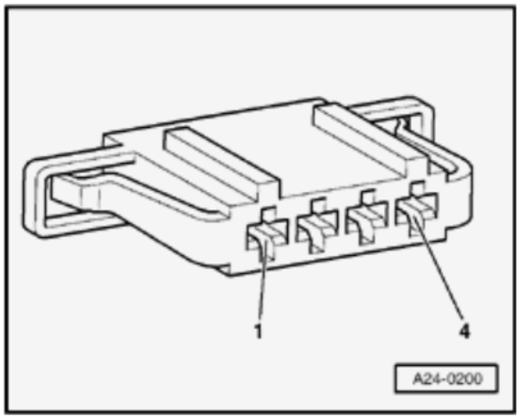

Fig. 272: Identifying 4-Pin Clutch Pedal Switch Terminals 1 & 2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check for open circuit and short to positive (B+) or ground (GND) in following wiring connection:

Connector Terminal	Test box V.A.G 1598/31 Socket
2	39

- Repair any open/short circuit as necessary.

Cruise Control System (CCS) switch -E45-, testing

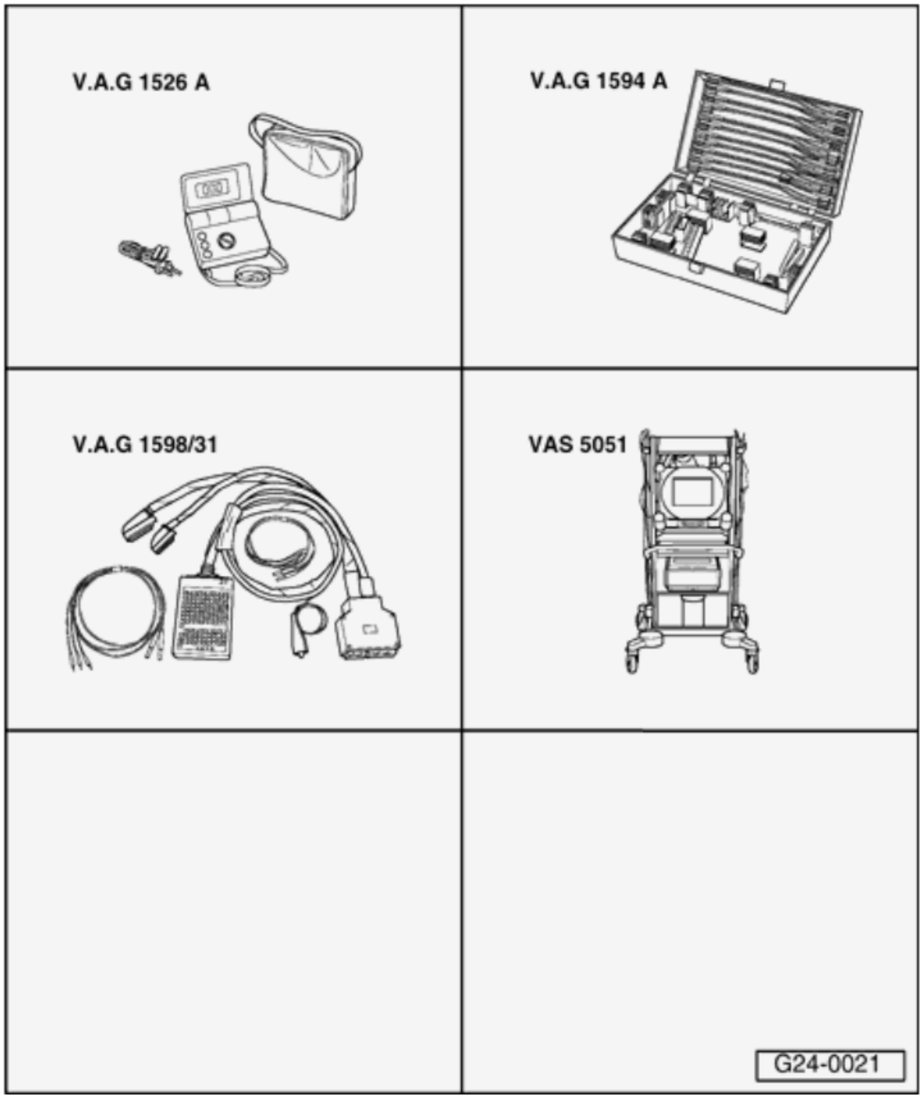

Fig. 273: Cruise Control System (CCS) Switch -E45-, Testing
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box
- VAS 5051 Vehicle diagnostic, testing and information system
- VAS 5051/1 Adapter

The cruise control system (CCS) has no components of its own (except for the operating switch -E45-). All cruise control functions are carried out by the Engine Control Module (ECM).

Work sequence

WARNING: To avoid danger of accident when performing measurement and test drives, observe safety precautions. Refer to Safety precautions

- Connect VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection.

When doing this the ignition must be switched on.

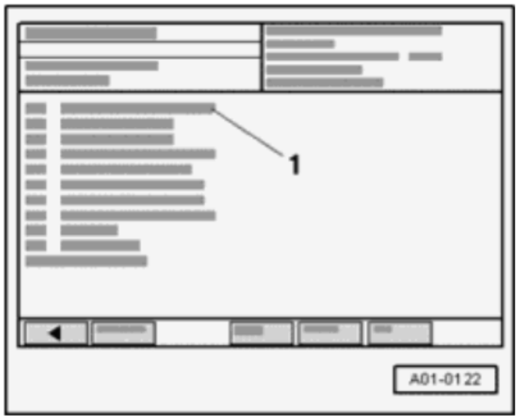

Fig. 274: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "08 - Read measured value block".

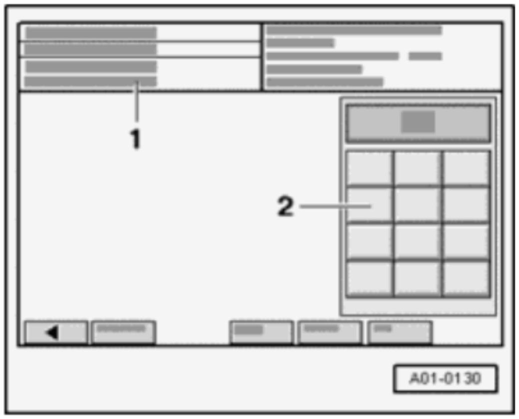

Fig. 275: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "066" for "display group number 066" in field -2- and confirm entry by pressing -Q- button.

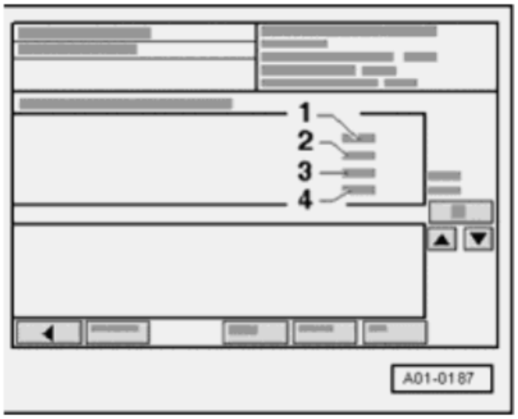

Fig. 276: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Check indication in display field -2-.
- Road test vehicle to check switch positions as shown in display field -4-.

	Display fields			
	1	2	3	4
Display group 066: Signals to Engine Control Module (ECM)				
Display	xxx km/h	**XXXXXXXX**	xxx km/h	**XXXXXXXX**
Display	ACTUAL speed	**Switch settings**	SPECIFIED speed	**Switch settings**
Range		**0 = off 1 = on**		**0 = off 1 = on**
Specified value		**XXXX0XXX (if CCS not activated)**		XXXXXXXX
		XXXX1XXX (if CCS activated)		
	Value: X = no meaning If "0" is displayed on vehicles with cruise control system: Activate the cruise control system. Refer to **Cruise control system, activating/deactivating**.		Significance of 8-digit display. Refer to **Significance of 8-digit display in display field 4**	

- Exit function "08 - Read measured value block" by pressing <-- button.

If "0" appears in display field 2 even with activated CCS:

- Connect V.A.G 1598/31 test box to wiring harness for Engine Control Module (ECM) and also directly to Engine Control Module. Refer to **Electrical testing using VAG1598/31 test box**.
- Connect multimeter as follows to measure voltage:

Test box V.A.G 1598/31 Socket	Measure to
38	Engine ground (GND)

- Switch ignition on.

- Specification for CCS switched off: 0 V
- Specification for CCS switched on: approx. battery voltage (B+)

If the specified value is not obtained:

- Check for open circuit and short to positive (B+) or ground (GND) in following wiring connections:

Test box V.A.G 1598/31 Socket	Steering Column Electronic Systems Control Module -J527- terminal
38	Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

- Repair any open/short circuit as needed.

Significance of 8-digit display in display field 4

Switch position	Display field 4							
CCS locked "OFF"	0	X	0	0	0	0	0	0
CCS locked "ON" (standby)	**1**	X	0	0	0	0	0	**1**
CCS keyed "OFF"	**1**	X	0	0	0	0	**1**	**1**
Tip down/decelerate	**1**	X	0	0	0	**1**	0	**1**
Tip up/accelerate	**1**	X	0	0	**1**	0	0	**1**
Set	**1**	X	0	**1**	0	0	0	**1**
Reactivation	**1**	X	**1**	0	0	0	0	**1**

If specifications in display field 4 are not obtained:

- Check CCS switch -E45-.

ADDITIONAL SIGNALS, CHECKING

Additional signals, checking

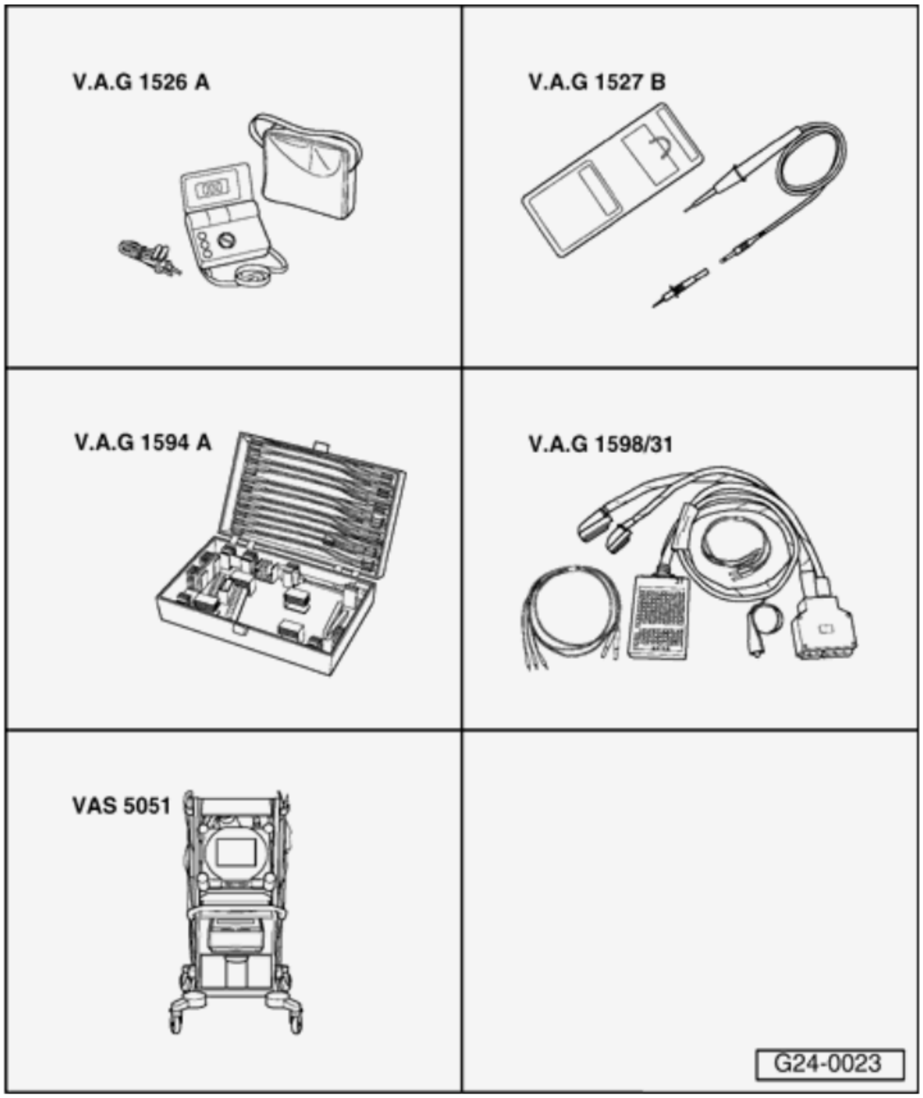

Fig. 277: Identifying Special Tools - Additional Signals, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1527 B LED voltage tester
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box

- VAS 5051 Vehicle diagnostic, testing and information system

- VAS 5051/1 Adapter

Engine speed (RPM) signal, checking

Vehicles with automatic transmission

NOTE:

- **The signal is generated by the Engine speed (RPM) sensor -G28- processed in the Engine Control Module (ECM) and directed to various parts of the electronic system (e.g. control module for A/C or ABS/EDS) from terminal 37 of the ECM. Engine speed signal and wire connections are monitored by these systems.**
- **Checking Engine speed (RPM) sensor -G28-. Refer to Engine speed (RPM) sensor -G28-, checking**

- Connect test box V.A.G 1598/31 to wiring harness for Engine Control Module (ECM); do not connect ECM. Refer to **Electrical testing using VAG1598/31 test box**.
- Check for open circuit and short to positive (B+) or ground (GND) in following wiring connections:

Test box V.A.G 1598/31 Socket	Instrument cluster Terminal
37	. Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

- Repair any open/short circuit as needed.

If no problems with wiring are found:

- Checking CAN bus. Refer to **Data exchange, Motronic/ABS (CAN-bus), checking**.

Crash signal, checking

The Engine Control Module (ECM) receives the crash signal ("Crash cut-off was triggered") from the airbag control module.

The airbag control module sends the crash signal to the Engine Control Module (ECM) (during an accident or if a Output Diagnostic Test Mode (DTM) is carried out relating to the airbag system), the ECM switches off the fuel pump. This means that the engine will stop running but can be started again afterward (e.g. to remove vehicle from danger).

- Connect test box V.A.G 1598/31 to wiring harness for Engine Control Module (ECM); do not connect test box directly to Engine Control Module (ECM). Refer to **Electrical testing using VAG1598/31 test box**.
- Check for open circuit and short to positive (B+) or ground (GND) in following wiring connections:

Test box V.A.G 1598/31 Socket	Airbag Control Module -J234- Terminal
67	. Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

- Repair any open/short circuit as necessary.

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

If no problems with wires are found:

- Check DTC memory of Airbag Control Module -J234-.

Data exchange, Motronic/ABS (CAN-bus), checking

NOTE:

- **Data exchange between individual control modules occurs via a bus system.**
- **The term "bus" refers to a system that transports and distributes data.**
- **The wire connections between the control modules, via which data is transferred, are referred to as data wires.**
- **Data is transferred to the connected control modules serially (one after the other) across the data wires..**

Checking the bus system

The DTC table suggested checking the data exchange between the Engine/Transmission/ABS control modules.

- Check whether correct engine, transmission (if installed) and ABS control modules are installed in this vehicle (part numbers) and whether coding is appropriate for control modules. (Refer to indicated ID codes for control modules).

To determine if the correct control modules are installed:

- Connect VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection.

When doing this the ignition must be switched on.

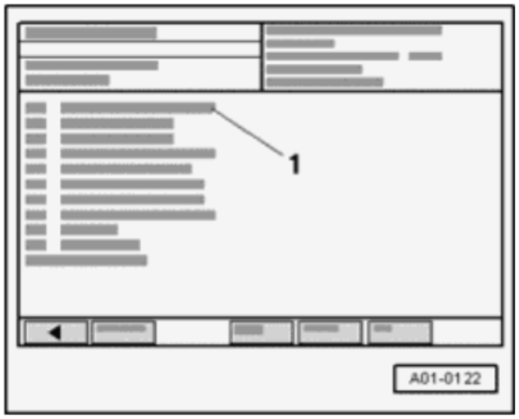

Fig. 278: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "08 - Read measured value block".

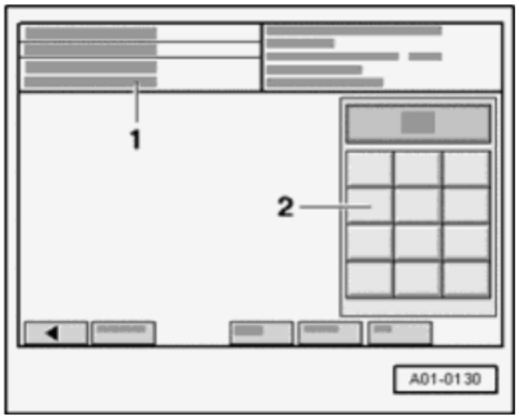

Fig. 279: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

NOTE: The measured value blocks 125 and 126 indicate CAN drive users.

- Enter "125" for "display group number 125" in field -2- and confirm entry by pressing -Q- button.

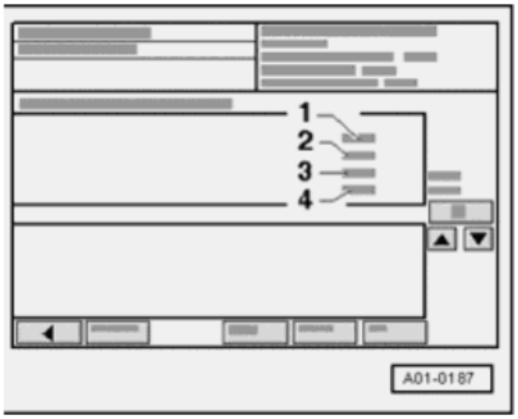

Fig. 280: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Check displays in fields -1- to -4-.

CAN-bus compatible control modules are displayed with the Engine Control Module:

- No display: Engine Control Module not CAN-compatible
- Display 1: CAN-compatible control module is a data bus user
- Display 0: CAN able control module is not user of the Databus

- To switch to display group 126 press [Back Arrow] button.
- Check in same way with display group 126.
- To switch to display group 127 press [Back Arrow] button.
- Check in same way with display group 127.

- Exit function "08 - Read measured value block" by pressing <-- button.

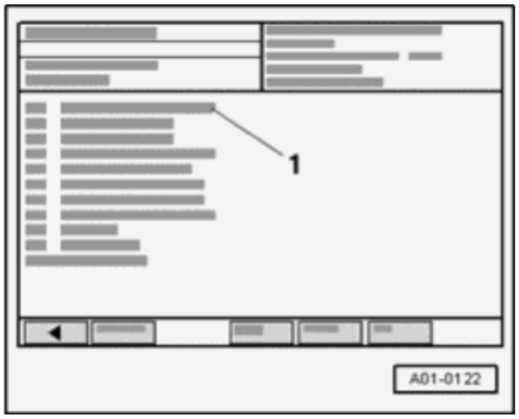

Fig. 281: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "06 - End output".

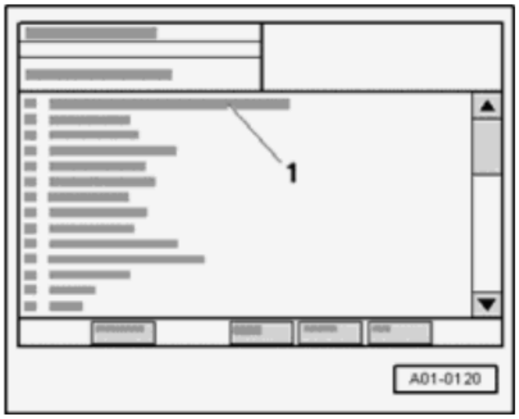

Fig. 282: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "02 - Check DTC memory - Total system".

- The DTC memory is then checked for all systems in the vehicle which are capable of On Board Diagnostic (OBD).

If a control module answers with its identification, the number of DTCs stored or "No DTCs detected" appears on the display.

Any system DTCs that are stored are displayed successively. The VAS 5051 will then transmit the next address word.

If a DTC is displayed relating to "Data bus drive" or "...CAN bus":

- Check that Engine Control Module (ECM) and other CAN-compatible control modules installed are suitable for this vehicle (part no. and code).

If the correct control modules are installed:

- Check that multiple connectors for control modules are properly seated.

If the multi-pin connectors are firmly seated:

- Check CAN bus system.

The following systematic procedure is useful for troubleshooting if three or more control modules are communicating via a "two-line bus system":

- Evaluate DTCs stored in control modules.

NOTE: This analysis will help to locate the cause of the line malfunction.

Example 1:

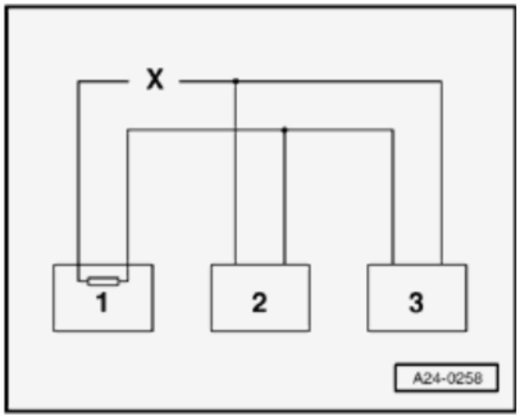

Fig. 283: Control Module 1 Not Communicating With Control Modules 2 And 3
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The DTCs stored in the DTC memory indicate that the control module 1 does not communicate with control modules 2 and 3.

Control module	DTCs stored in DTC memory
1	• No message from control module 2 • No message from control module 3
2	• No message from control module 1
3	• No message from control module 1

- Switch ignition off.
- Disconnect control modules connected across bus wires and check bus wires for an open circuit.

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

- Replace control module 1 if no malfunctions can be found in bus wires.

Example 2:

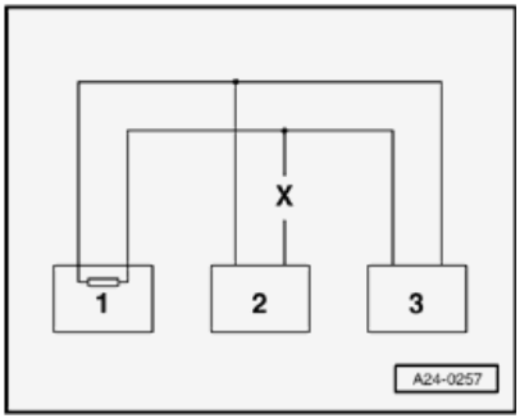

Fig. 284: Control Module 2 Not Communicating With Control Modules 1 And 3
Courtesy of VOLKSWAGEN UNITED STATES, INC.

From the DTCs stored in the memories, it can be determined that control module 2 is not communicating with control modules 1 and 3.

Control module	DTCs stored in DTC memory
1	• No message from control module 2
2	• No message from control module 1 • No message from control module 3
3	• No message from control module 2

- Switch ignition off.
- Disconnect control modules connected across bus wires and check bus wires for an open circuit.

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

- Replace control module 2 if no malfunctions can be found in bus wires.

Example 3:

Using the DTCs stored in the memories, it can be determined that none of the control modules are sending or receiving signals.

Control module	DTCs stored in DTC memory
1	• Powertrain data bus malfunction
2	• Powertrain data bus malfunction
3	• Powertrain data bus malfunction

- Switch ignition off.

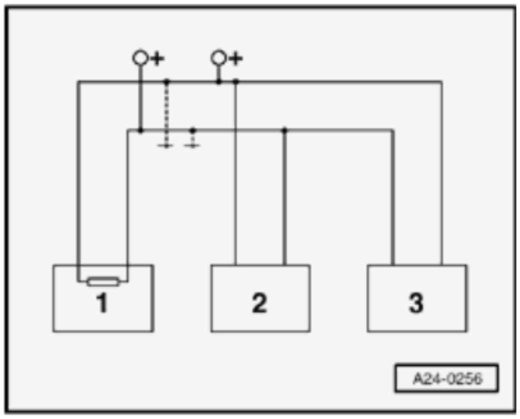

Fig. 285: Checking Bus Wires For Short Circuit To B+ Or Ground
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect control modules connected across bus wires and check for a short circuit between bus wires.

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

If a cause cannot be determined for the DTC "Powertrain databus malfunction," check whether the DTC is caused by one of the control modules

Requirements

- Vehicle diagnosis, measurement and information system VAS 5051 connected and vehicle self-diagnosis selected. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions**.

All control modules that use the CAN-bus are still disconnected.

The ignition is switched off.

- Connect one of control modules.

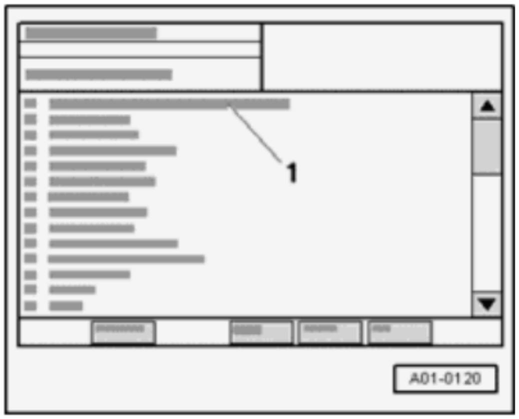

Fig. 286: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Connect VAG 1551.

- Switch ignition on.
- Press appropriate vehicle system in selection -1-.
- Check DTC memory of control module just connected and erase it.
- Press <-- button.

- Press diagnostic function "06 - End Output" in selection -1-.
- Switch ignition off and on again.
- Leave ignition switched on for 10 seconds. Then read DTC memory of control module just connected using Scan Tool (ST).
- If DTC "Powertrain CAN-bus malfunction" is displayed, replace control module just connected.

- If DTC "Powertrain CAN-bus malfunction" is not displayed, connect next control module and repeat procedure.

VACUUM DIAGRAM

Vacuum diagram for vehicles up to 06.03

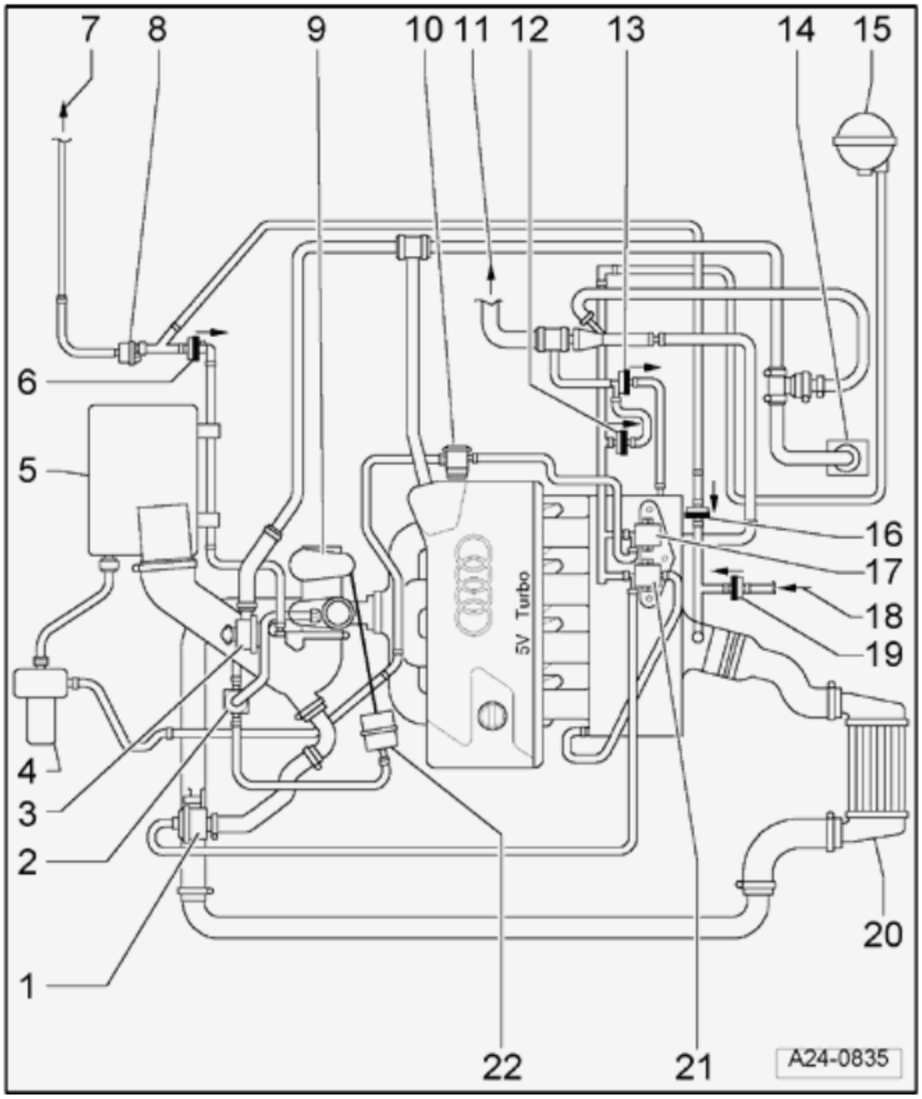

Fig. 287: Vacuum Diagram For Vehicles Up To 06.03
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Mechanical recirculation valve

2 - Wastegate Bypass Regulator Valve -N75-

3 - Pressure regulator valve for crankshaft housing ventilation

4 - Secondary Air Injection (AIR) Pump Motor -V101-

5 - Air filter

- With Mass Air Flow (MAF) Sensor -G70-

6 - Check valve

- Installed position: Arrow on valve points in direction of flow, as shown in **Fig. 287**.

7 - to EVAP canister

8 - Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-

9 - Turbocharger

10 - Combination valve for secondary air injection (AIR)

11 - To brake booster

12 - Check valve

- Installed position: Arrow on valve points in direction of flow, as shown in **Fig. 287**.

13 - Check valve

- Installed position: Arrow on valve points in direction of flow, as shown in **Fig. 287**.

14 - Crankshaft housing ventilation

15 - Vacuum reservoir

- Component location: Under wheelhousing liner in front left wheelhousing

16 - Check valve

- Installed position: Arrow on valve points in direction of flow, as shown in **Fig. 287**.

17 - Secondary Air Injection (AIR) Solenoid Valve -N112-

- Component location: Below intake manifold

18 - To Leak Detection Pump (LDP) -V144-

19 - Check valve

- Installed position: Arrow on valve points in direction of flow, as shown in **Fig. 287**.

20 - Charge air cooler

- With Charge Air Pressure Sensor -G31-

21 - Recirculating valve for turbocharger -N249-

- Component location: Below intake manifold

22 - Vacuum diaphragm for boost pressure regulation

- When the combination valve is opened, the mechanical boost pressure regulation valve in the turbocharger is opened and secondary air is thereby channeled past the turbocharger directly to the catalytic converter

Vacuum diagram for vehicles as of 07.03

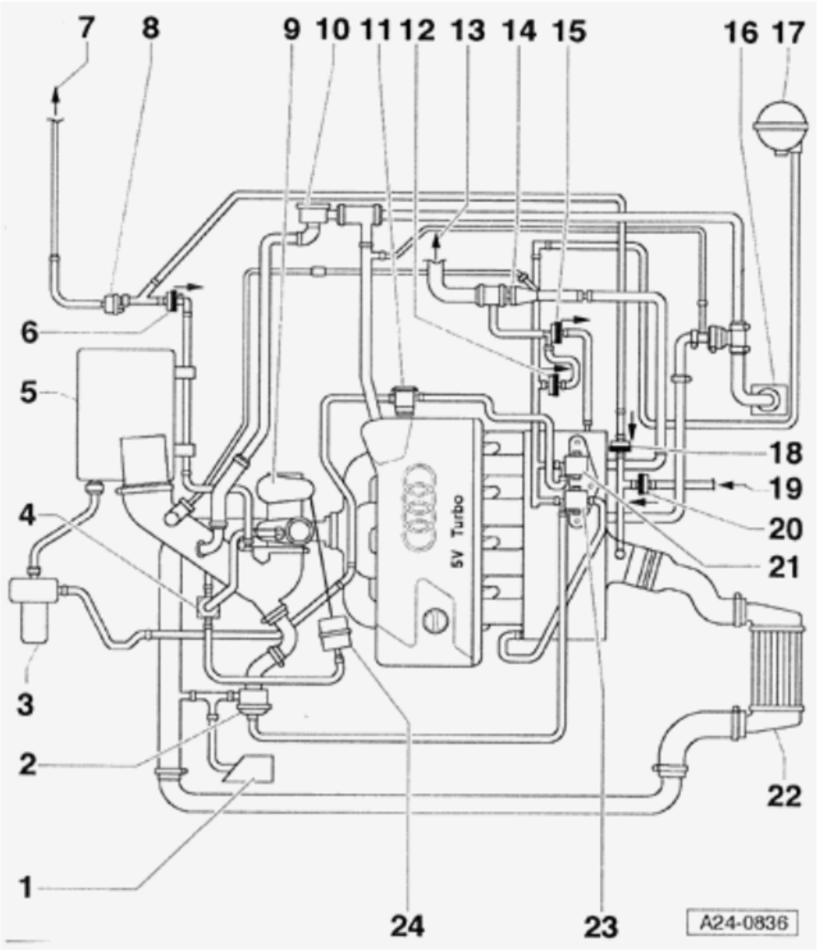

Fig. 288: Vacuum Diagram For Vehicles As Of 07.03
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Resonator

2 - Mechanical recirculation valve

3 - Secondary Air Injection (AIR) Pump Motor -V101-

4 - Wastegate Bypass Regulator Valve -N75-

5 - Air filter

- With Mass Air Flow (MAF) Sensor -G70-

6 - Check valve

- Installed position: Arrow on valve points in direction of flow, as shown in .

7 - to EVAP canister

8 - Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-

9 - Turbocharger

10 - Pressure regulator valve for crankshaft housing ventilation

11 - Combination valve for secondary air injection (AIR)

12 - Check valve for EVAP canister

- Installed position: Arrow on valve points in direction of flow, as shown in **Fig. 288**.

13 - To brake booster

14 - Vacuum suction jet pump

15 - Check valve

- Installed position: Arrow on valve points in direction of flow, as shown in **Fig. 288**.

16 - Crankshaft housing ventilation

17 - Vacuum reservoir

- Component location: Under wheelhousing liner in front left wheelhousing

18 - Check valve

- Installed position: Arrow on valve points in direction of flow, as shown in **Fig. 288**.

19 - to Leak Detection Pump (LDP) -V144-

20 - Check valve

- Installed position: Arrow on valve points in direction of flow, as shown in **Fig. 288**.

21 - Secondary Air Injection (AIR) Solenoid Valve -N112-

- Component location: Below intake manifold

22 - Charge air cooler

- With Charge Air Pressure Sensor -G31-

23 - Recirculating valve for turbocharger -N249-

- Component location: Below intake manifold

24 - Vacuum diaphragm for boost pressure regulation

- When the combination valve is opened, the mechanical boost pressure regulation valve in the turbocharger is opened and secondary air is thereby channeled past the turbocharger directly to the catalytic converter

; Instrument panel; removing driver-side storage compartment ; Instrument panel; removing driver-side storage compartment ; Instrument panel; Driver-side storage compartment, removing

28 IGNITION/GLOW PLUG SYSTEM

IGNITION SYSTEM, CHECKING

General notes on ignition system

- Always switch off the ignition before connecting or disconnecting the battery, otherwise the Engine Control Module (ECM) may be damaged.
- A voltage of at least 12.7 V is necessary for satisfactory functioning of the electrical components.
- In the case of some tests, a malfunction may be recognized and stored by the control module. At the end of all tests and repairs, therefore, the DTC memory should be checked and, if necessary, erased.
- If the engine starts briefly and then stops after DTC search, repair or tests on components, this may be because the Immobilizer is blocking the Engine Control Module (ECM). The DTC memory must then be checked and, if necessary, adaptation carried out on the control module.

CAUTION:

- **Measures to be taken prior to disconnecting the battery:**

Refer to

- **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
- **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL for ELECTRICAL EQUIPMENT, CABRIOLET**

, Battery, Starter, Generator, Cruise Control

- **Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.**

Safety precautions

To prevent injuries to persons and/or damage to the fuel injection and ignition system, the following must be noted:

- Do not touch or disconnect ignition wiring when the engine is running or at starter speed.
- Always switch off the ignition before connecting or disconnecting ignition system wiring. This also applies to HT cables and measuring instrument leads.
- To run engine at starting speed without actually starting it (for example, in order to test compression), remove connector from the power output stage of the ignition coils and also the connectors on the injectors.
- In the case of some tests, a malfunction may be recognized and stored by the control module. At the end of all tests and repairs, therefore, the DTC memory should be checked and, if necessary, erased. After

erasing the DTC memory, generate a readiness code.

- Always switch off the ignition before washing the engine.

Technical Data

Engine code letters	**AMB (1.8 l/5V/125 kW engine)**
Idle speed Not adjustable - controlled by the idle speed stabilization	700 to 860 RPM
Engine speed limitation Shuts off injectors	approx. 6800 RPM
Ignition timing is determined by the control module. Ignition timing cannot be adjusted.	
Ignition system	Individual coil system with 4 ignition coils (power output stages integrated) connected directly to spark plugs via spark plug connectors
Spark plugs	Tightening torque: 30 Nm
Firing order	1-3-4-2

Ignition coils with power output stages, checking

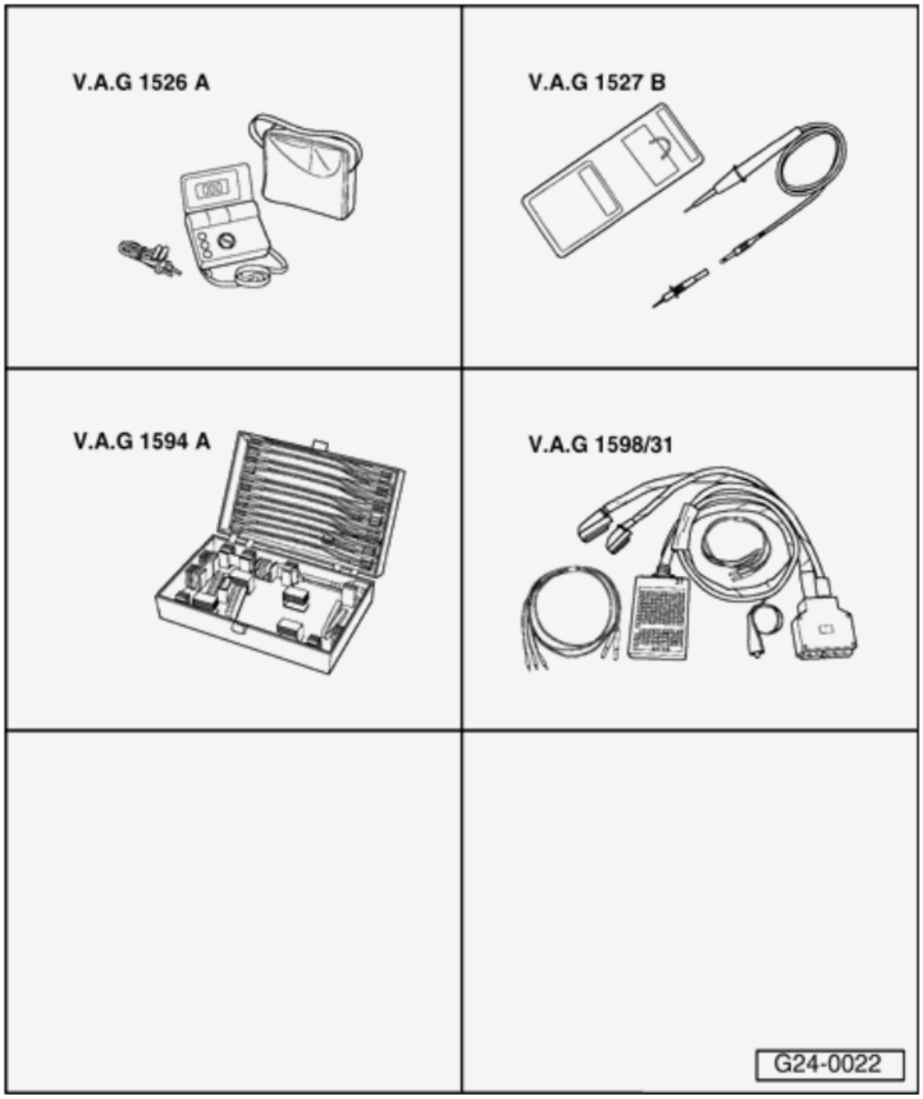

Fig. 289: Identifying Special Tools - Ignition Coils With Power Output Stages, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1527 B Voltage tester
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box

Work sequence

NOTE: The ignition coil and the power output stage are combined in a common component.

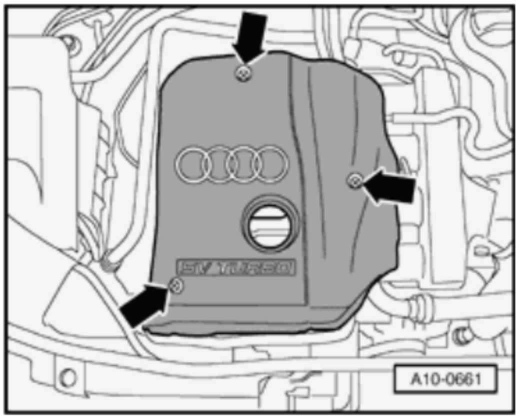

Fig. 290: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover (arrows).

Identify an inoperative or misfiring cylinder as follows:

- Test misfire detection. Refer to **Misfire recognition, checking**.

If misfires are detected:

- Continue checking indicated cylinder. Refer to "If the faulty cylinder is recognized".

If no misfires were detected:

- Disconnect connectors from injectors in sequence with engine running, and observe how engine runs.

or

- Compare spark plugs of all cylinders with each other and check for soot on electrodes.

If the faulty cylinder is recognized:

- Replace spark plug of faulty cylinder with one from another cylinder.

If the malfunction moves with the spark plug:

- Replace spark plug.

If the malfunction remains in the same cylinder:

- Replace ignition coil from faulty cylinder with one from another cylinder.

If the malfunction moves with the ignition coil:

- Replace ignition coil.

Checking Ground (GND) connection

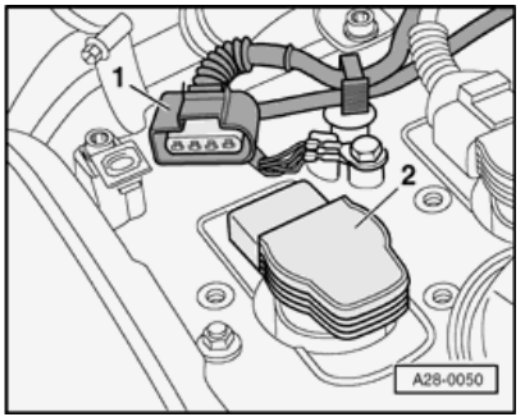

Fig. 291: Disconnecting 4-Pin Connector From Ignition Coil
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect 4-pin connector -1- from ignition coil -2-.

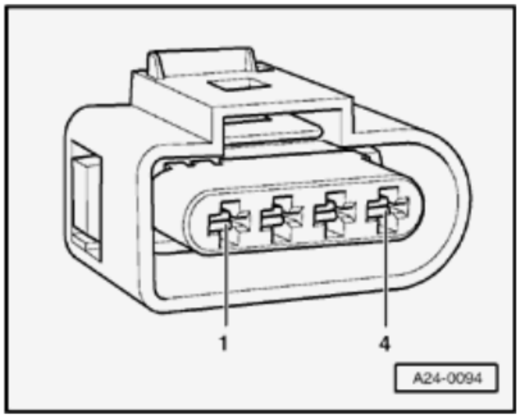

Fig. 292: Identifying Connector Terminals 1 And 4
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect voltage tester V.A.G 1527 B as follows:

Connector Terminal	Measure to
2	Battery positive (B+)
4	Battery positive (B+)

- LED must light up.

If the LED does not light up:

- Check wiring connections.

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

If LED lights up:

Checking power supply

Requirements

- Fuses for engine electronics OK

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

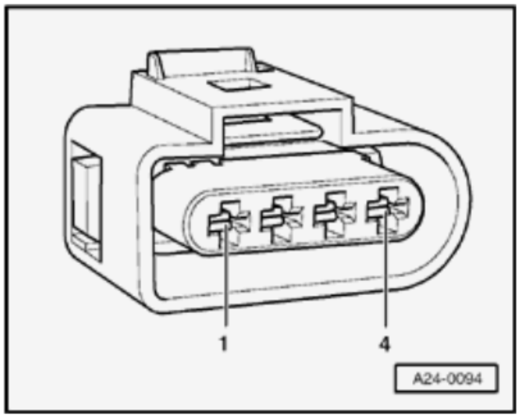

Fig. 293: Identifying Connector Terminals 1 And 4
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter as follows to measure voltage:

Connector Terminal	Measure to
1	Engine ground (GND)

- Switch ignition on.
- Specified value: approx. battery voltage (B+)

If specified value is obtained:

- Check activation of power output stages. Refer to **Checking activation of power output stages**.

If specified value is not obtained:

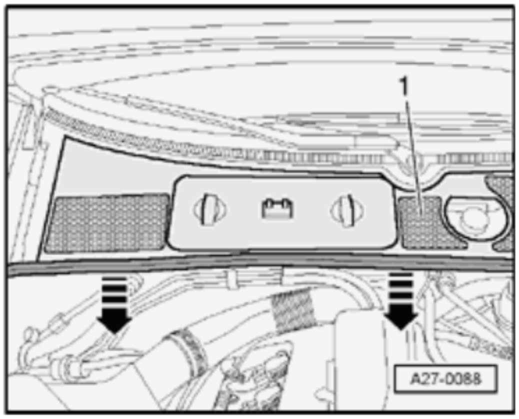

Fig. 294: Identifying Plenum Chamber Cover & Removing Rubber Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rubber seal of plenum chamber cover in direction of arrow.
- Remove plenum chamber cover -1- from front.

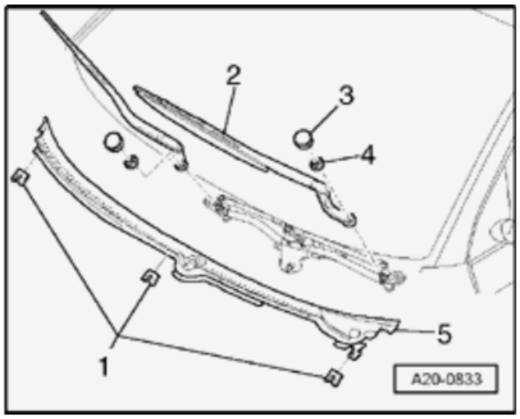

Fig. 295: Removing Securing Clips And Cowl
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry off both trim caps -3- with a screwdriver.
- Undo hex nuts -4- a few turns.
- Release wiper arms -2- from pivot shaft by tilting them slightly.
- Remove hex nuts completely and remove wiper arms.

- Remove retaining clips -1- and remove air cowl grille -5-.

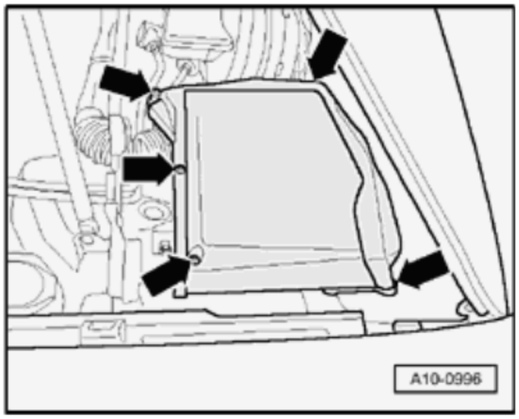

Fig. 296: Removing Screws And Cover From E-Box In Plenum Chamber
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover for electronics box (plenum chamber) (arrows).

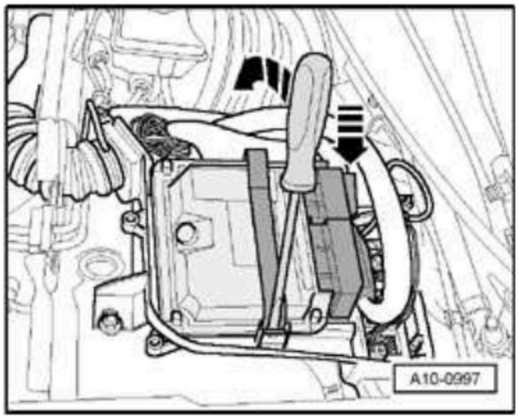

Fig. 297: Using Screwdriver To Remove Retainer Bar And Engine Control Module (ECM) J623
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift off ECM retaining clip using a screwdriver (arrow) and move module to side.
- If installed, unclip Transmission Control Module (TCM) retaining clip and move module to one side.

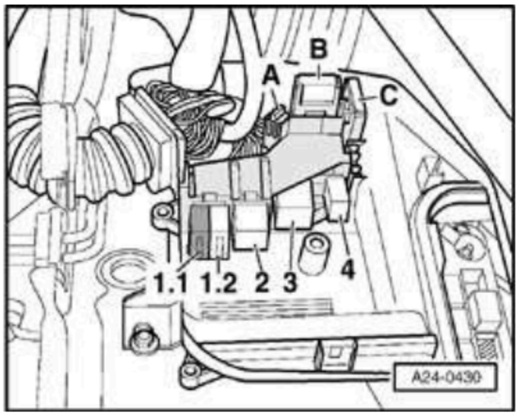

Fig. 298: Component Location For Secondary Air Injection (AIR) Pump Relay J299

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect power supply relay -2-.
- Perform following tests:

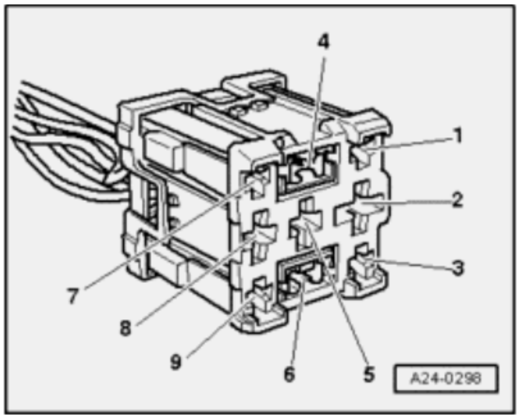

Fig. 299: Identifying Secondary Air Pump Relay Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check wiring of relay carrier, electronics box, plenum chamber, position 2, terminal 8, to connector of ignition coil terminal 1.
- Check Motronic ECM power supply relay -J271-. Refer to **Motronic ECM Power supply relay -J271-, checking**.

Checking activation of power output stages

- Disconnect all injector connectors.

NOTE: **It is important to ensure that no fuel is injected during the test, as this would damage the catalytic converter. Therefore, the connectors on the injectors must be disconnected.**

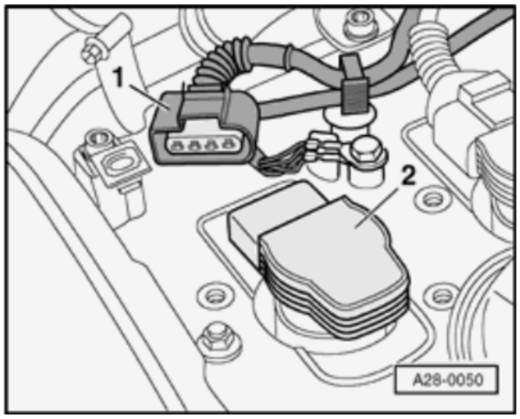

Fig. 300: Disconnecting 4-Pin Connector From Ignition Coil
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect 4-pin connector -1- from ignition coil -2-.

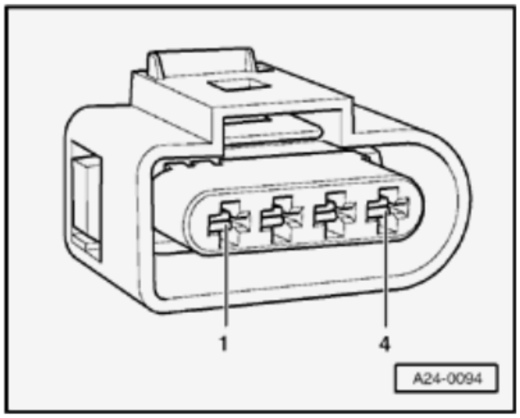

Fig. 301: Identifying Connector Terminals 1 And 4
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect LED voltage tester V.A.G 1527 B to terminals -2- and -3- of 4-pin ignition coil connector.
- Operate starter briefly.

- LED voltage tester must flash (flashes briefly).

If LED does not flash:

- Connect test box V.A.G 1598/31 to wiring harness for ECM; do not connect ECM. Refer to **Electrical testing using VAG1598/31 test box**.

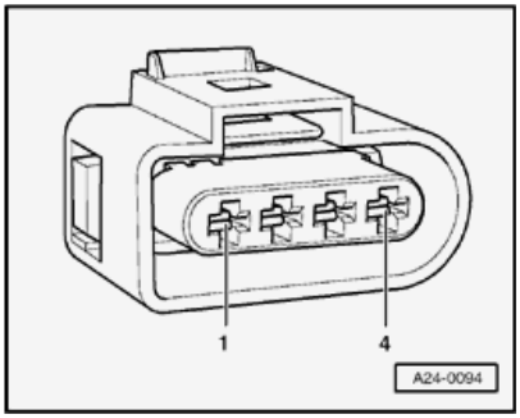

Fig. 302: Identifying Connector Terminals 1 And 4
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check for open circuit, short to positive or short to ground in following wiring connections:

Connector Terminal	Test box V.A.G 1598/31 Socket
3 (cyl. 1)	102

3 (cyl. 2)	95
3 (cyl. 3)	103
3 (cyl. 4)	94

- Repair any open/short circuit as necessary.

If no wiring malfunctions are found:

- Replace common component ignition coil with power output stage.

Motronic ECM Power supply relay -J271-, checking

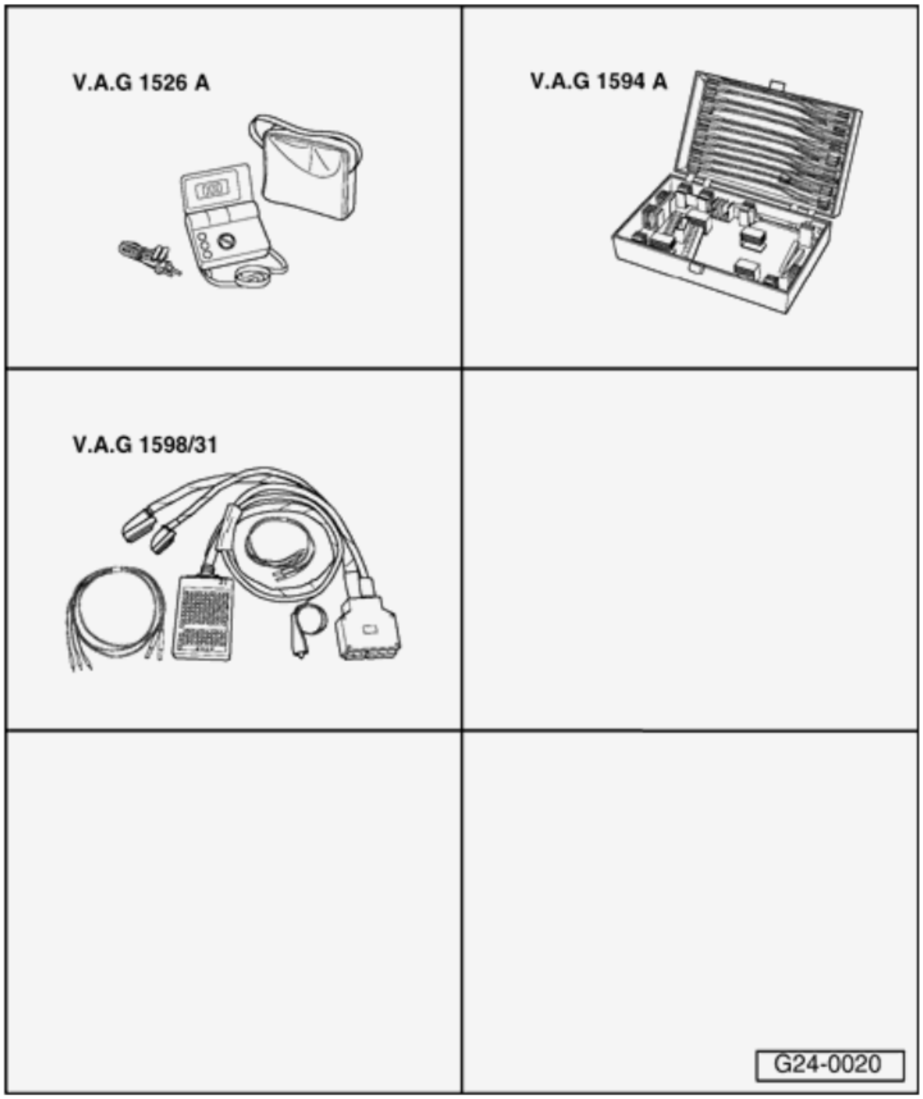

Fig. 303: Identifying Special Tools - Motronic ECM Power Supply Relay -J271-, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box

NOTE: The Motronic ECM power supply relay -J271- supplies the ignition coils with output stages as well as the ECM on Pin 121 with power.

Work sequence

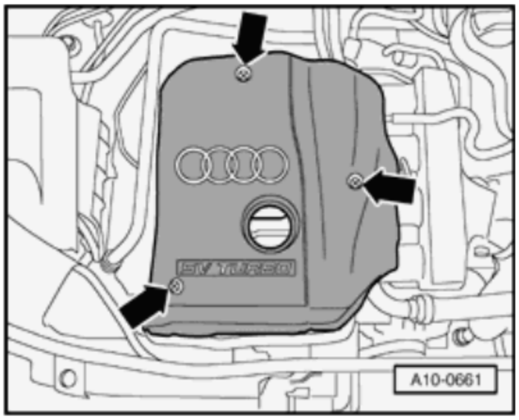

Fig. 304: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover (arrows).

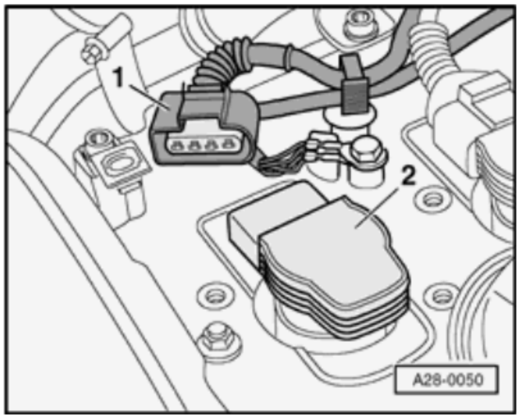

Fig. 305: Disconnecting 4-Pin Connector From Ignition Coil
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect 4-pin connector -1- from ignition coil -2-.

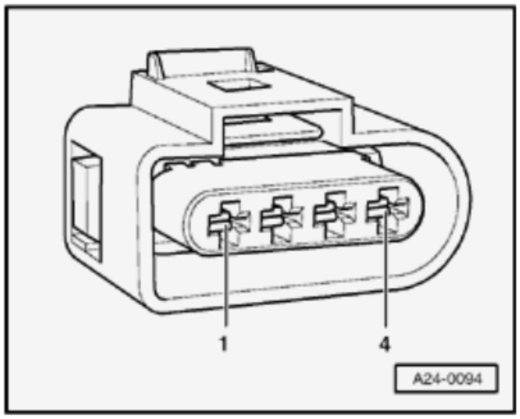

Fig. 306: Identifying Connector Terminals 1 And 4
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter as follows to measure voltage.

Connector Terminal	Measure to
1	Engine ground (GND)

- Switch ignition on.

- Specified value: approx. battery voltage (B+)

If specified value is not obtained:

- Switch ignition off.

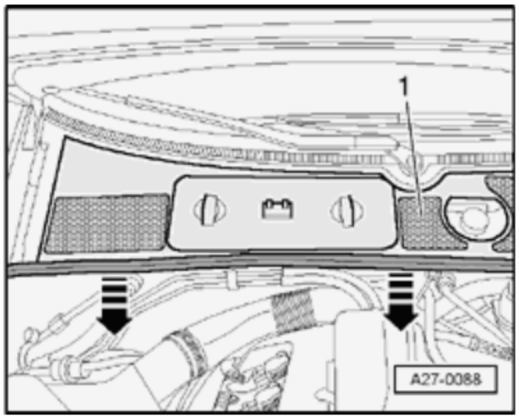

Fig. 307: Identifying Plenum Chamber Cover & Removing Rubber Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove rubber seal of plenum chamber cover in direction of (arrow).
- Remove plenum chamber cover -1- from front.

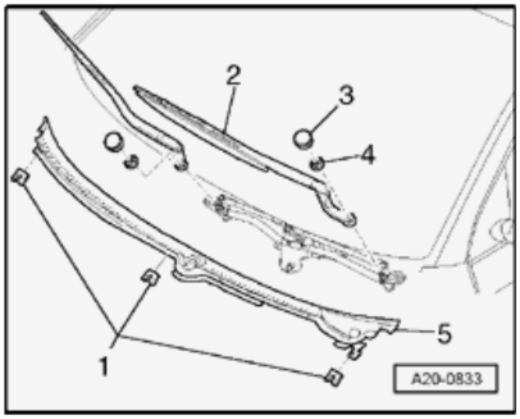

Fig. 308: Removing Securing Clips And Cowl
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry off both trim caps -3- with a screwdriver.
- Loosen hex nuts -4- several turns.
- Release wiper arms -2- from pivot shaft by tilting them slightly.
- Remove hex nuts completely and remove wiper arms.

- Remove retaining clips -1- and remove air cowl grille -5-.

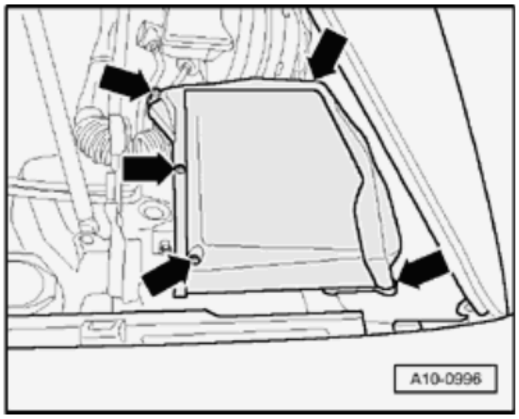

Fig. 309: Removing Screws And Cover From E-Box In Plenum Chamber
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover for electronics box (plenum chamber) -arrows-.

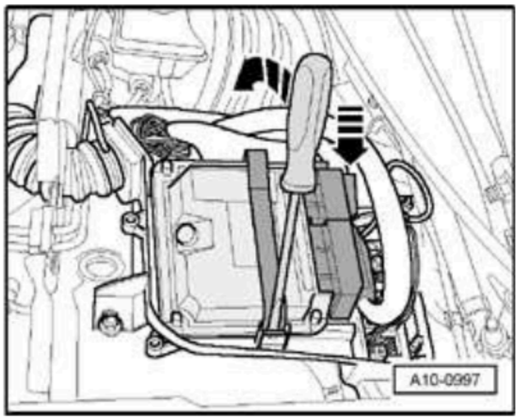

Fig. 310: Using Screwdriver To Remove Retainer Bar And Engine Control Module (ECM) J623
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Lift off ECM retaining clip using a screwdriver (arrow) and move module to side.
- If installed, unclip Transmission Control Module (TCM) retaining clip and move module to one side.

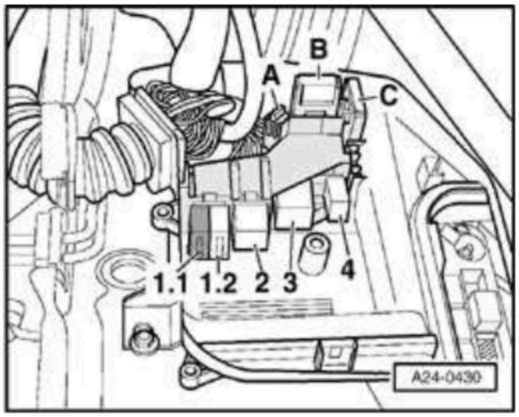

Fig. 311: Component Location For Secondary Air Injection (AIR) Pump Relay J299
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect power supply relay -3-.

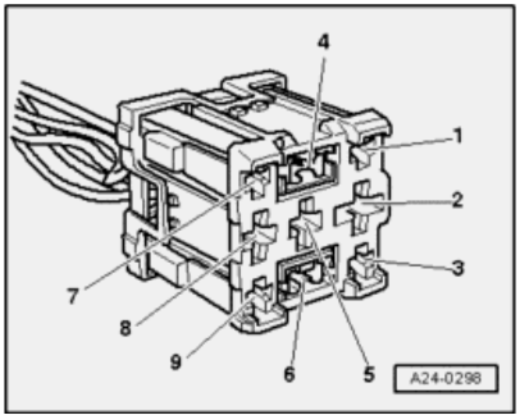

Fig. 312: Identifying Secondary Air Pump Relay Terminals

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check for open circuit in following wiring according to wiring diagram:

Relay carrier in electronics box, plenum chamber, position 2 Terminal	Connection of ignition coils Terminal
8	1

- Repair open circuit, if necessary.

If the wiring is OK:

- Check voltage supply of Motronic ECM power supply relay -J271-. Refer to **Checking power supply**.
- Check activation of Motronic ECM power supply relay -J271-. Refer to **Checking activation**.

Checking power supply

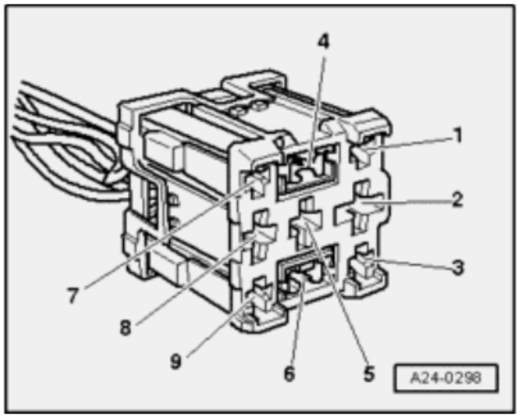

Fig. 313: Identifying Secondary Air Pump Relay Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter as follows to measure voltage.

Relay carrier in electronics box, plenum chamber, position 2 Terminal	Measure to
2	Engine ground (GND)
3	Engine ground (GND)

- Specified value: approx. battery voltage (B+)

If specified value is not obtained:

- Check wiring connections.

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

Checking activation

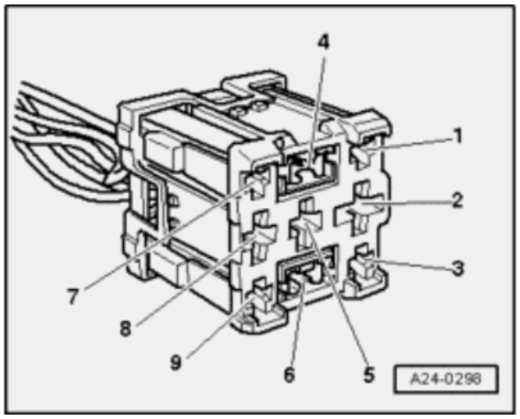

Fig. 314: Identifying Secondary Air Pump Relay Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter as follows to measure voltage.

Relay carrier in electronics box, plenum chamber, position 2 Terminal	Measure to
6	Battery positive (B+)

- Switch ignition on.

- Specified value: approx. battery voltage (B+)

If specified value is not obtained:

- Switch ignition off.
- Connect test box V.A.G 1598/31 to wiring harness for ECM; do not connect ECM. Refer to **Electrical testing using VAG1598/31 test box**.

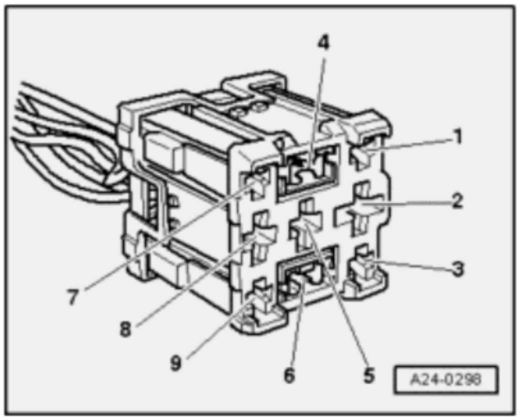

Fig. 315: Identifying Secondary Air Pump Relay Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check for open circuit, short to positive, or short to ground in following wiring connection(s):

Relay carrier in electronics box, plenum chamber, position 2 **Terminal**	**Test box V.A.G 1598/31** **Socket**
6	21

- Repair any open/short circuit as necessary.

If no malfunction is found:

- Replace Motronic ECM power supply relay -J271-.

Engine speed (RPM) sensor -G28-, checking

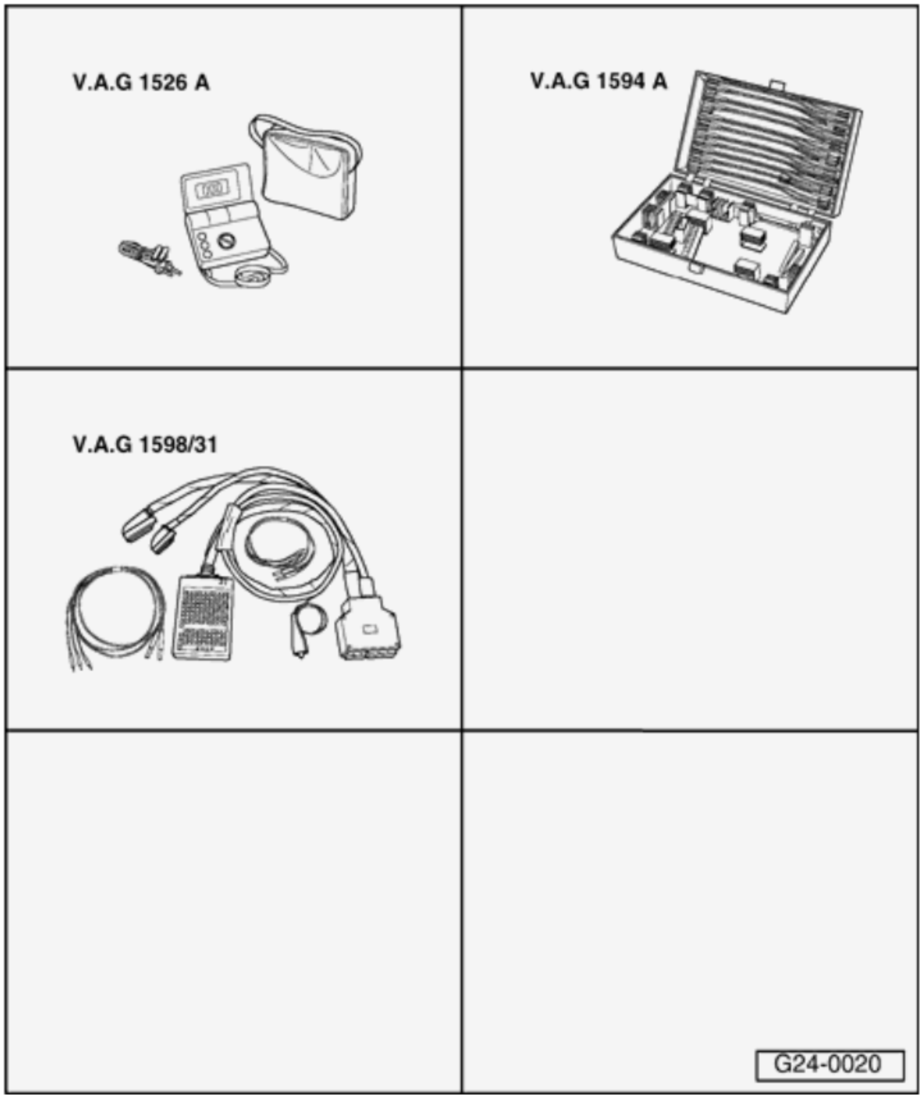

Fig. 316: Identifying Special Tools - Engine Speed (RPM) Sensor -G28-, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box

Component location --> **Component locations, overview**

NOTE: **The engine speed (RPM) sensor is a combined speed sensor and reference mark sensor. The engine cannot be started without a signal from the Engine speed (RPM) sensor -G28-. If the signal from the Engine speed (RPM) sensor -G28- fails while the engine is running, the engine will cut out immediately.**

Work sequence

- Before performing test, make sure that sensor is correctly installed and firmly seated.

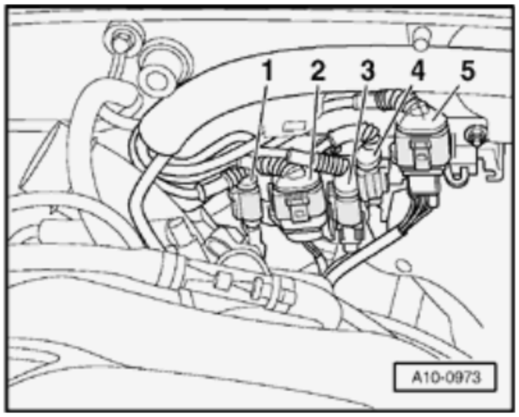

Fig. 317: Identifying Connectors For Oxygen Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect Engine speed (RPM) sensor connector -G28- -Pos. 3-.

NOTE:

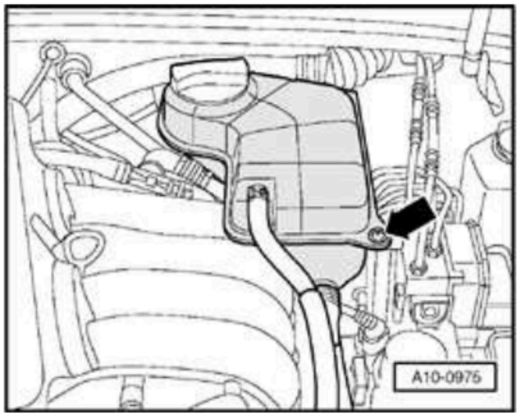

Fig. 318: Removing Coolant Expansion Tank Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

To gain access to the connector, remove coolant expansion tank bolt (arrow) and move expansion tank to the side. Fuel hoses remain connected.

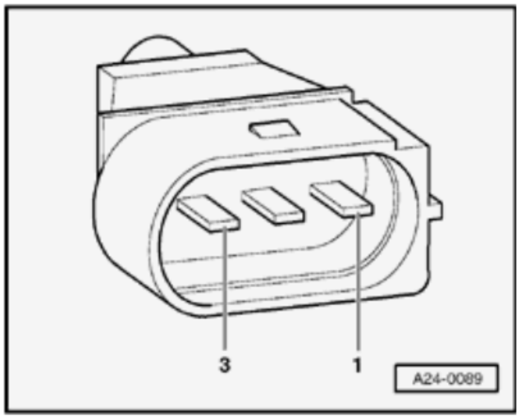

Fig. 319: 3-Pin Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter between terminals 2 and 3 to measure resistance.

- Specified value: 730...1000 ohms

NOTE: The resistance value of the Engine speed (RPM) sensor -G28- is associated with a temperature of 20 ° C. The resistance increases if the temperature increases.

If specified value is not obtained:

- Install new Engine speed (RPM) sensor -G28-.

If specified value is obtained:

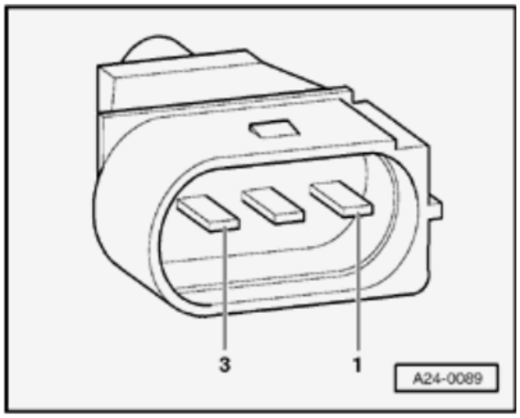

Fig. 320: 3-Pin Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter between terminals 2 and 1 -screen- and 3 and 1 -screen- to measure resistance.

- Specified value: each case infinity ohms (no continuity)

If specified value is not obtained:

- Install a new Engine speed (RPM) sensor -G28-.

If specified value is obtained:

- Connect test box V.A.G 1598/31 to wiring harness for ECM; do not connect ECM. Refer to **Electrical testing using VAG1598/31 test box**.

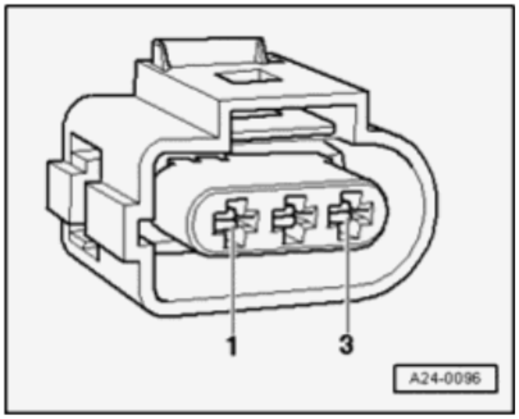

Fig. 321: Identifying 3-Pin Connector Terminals 1 & 3
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check for open circuit, short to positive, or short to ground in following wiring connections:

Connector Terminal	Test box V.A.G 1598/31 Socket
1 (screening)	108
2 (ground)	90
3 (signal)	82

- Repair any open/short circuit as necessary.

If no wiring problems are found:

- Replace ECM. Refer to **Engine Control Module (ECM) (without metal anti-theft housing), replacing**.

Intake Air Temperature (IAT) sensor -G42-, checking

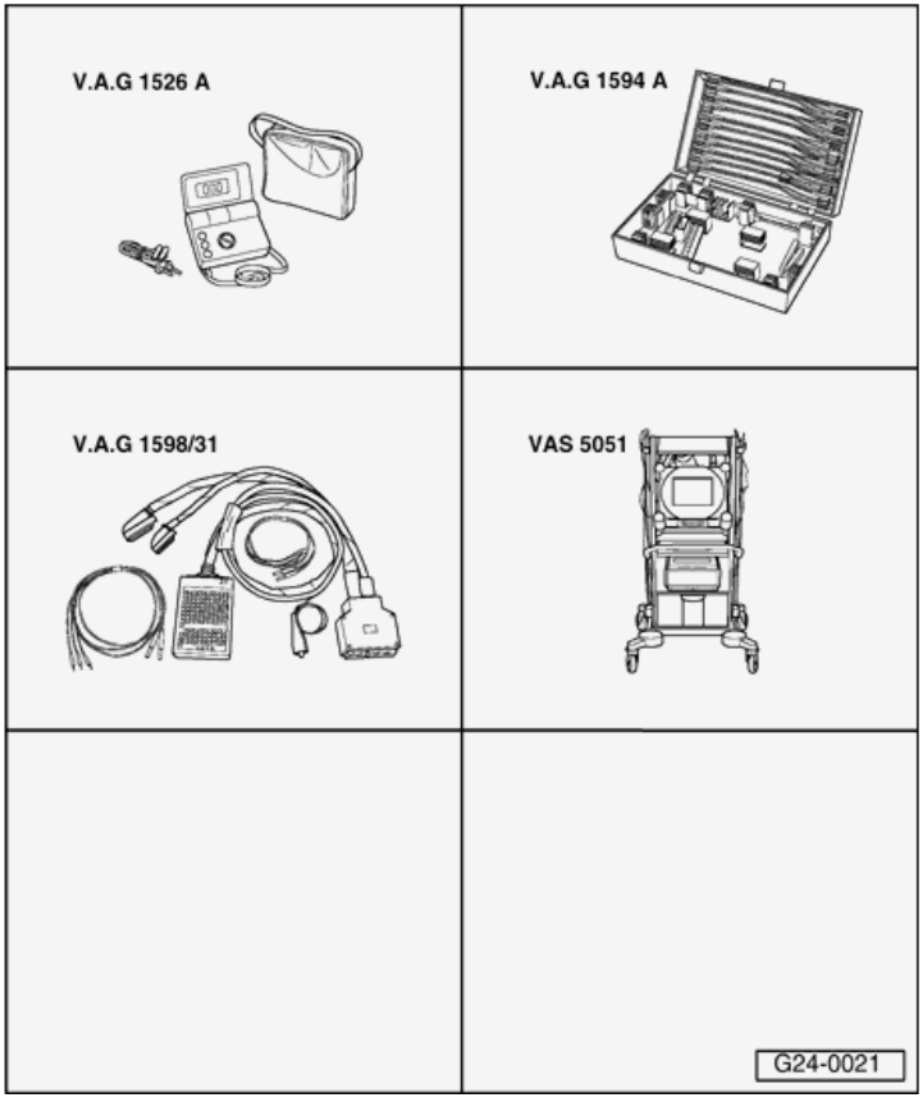

Fig. 322: Identifying Special Tools - Intake Air Temperature (IAT) Sensor -G42-, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box
- VAS 5051 Vehicle diagnostic, testing and information system with VAS 5051/1 B Adapter

Component location --> **Component locations, overview**

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection. Engine must be running at idle.

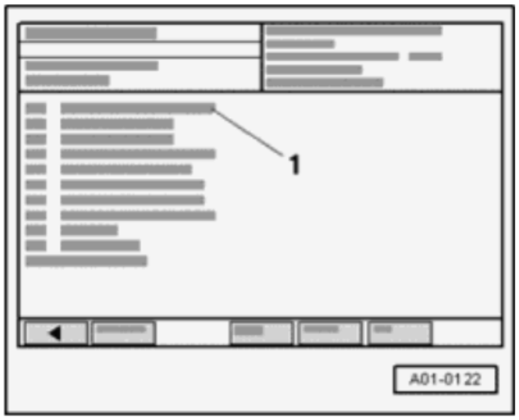

Fig. 323: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "08 - Read measured value block".

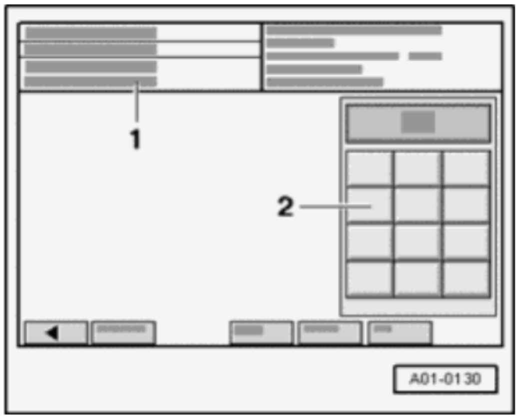

Fig. 324: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Display group input

- Enter "004" for "display group number 004" in zone -2- and confirm entry by pressing -Q- button.

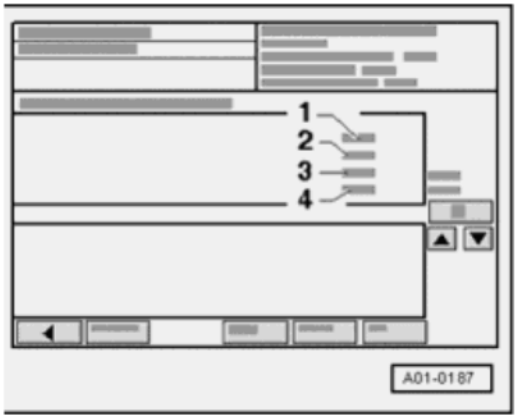

Fig. 325: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Check Intake Air Temperature (IAT) sensor in display zone -4-.

	Display zones			
	1	2	3	4
Display group 004: Intake air temperature with engine at idle				
Display	xxxx rpm	xx.x V	xxx.x ° C	**xxx.x ° C**
Display	Engine speed	Battery voltage (B+)	Coolant temperature	**Intake air temperature**
Range				**-48.0...143.0 ° C**
Specified value	xxxx rpm	12.0...15.0 volts	80.0...110.0 ° C	**Between ambient temperature and up to 110 ° C 1)**

1) If a temperature is displayed which deviates greatly from the ambient temperature of the sensor, check sensor and sensor wiring for terminal resistances and open circuit.

- Exit function "08 - Read measured value block" by pressing <-- button.

Checking wiring

- Disconnect connector to Intake Air Temperature (IAT) sensor -G42-.
- Connect test box V.A.G 1598/31 to wiring harness for ECM; do not connect ECM. Refer to **Electrical testing using VAG1598/31 test box**.

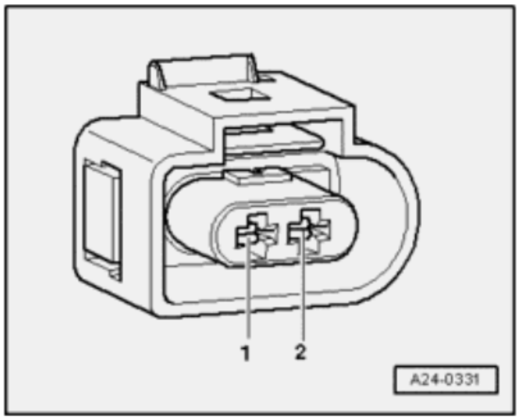

Fig. 326: Identifying 2-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check for open circuit, short to positive, or short to ground in following wiring connections:

Connector Terminal	Test box V.A.G 1598/31 Socket
1	85
2	108

- Test for short circuits between two wires.
- Repair any open/short circuit as necessary.

If no wiring problems are found:

Checking sensor

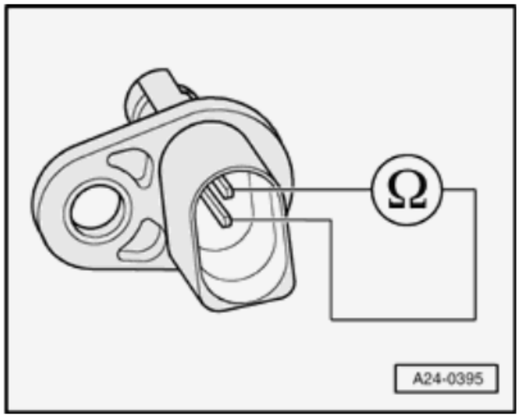

Fig. 327: Identifying Intake Air Temperature (IAT) Sensor -G42- Resistance
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter to sensor to measure resistance.

Specifications

Temperature ° C	Resistance k ohms
-20	approx. 13.8
0	approx. 5.5
20	approx. 2.4
40	approx. 1.1
60	approx. 0.6

If the specified values are not obtained:

- Replace Intake Air Temperature (IAT) sensor -G42-.

Engine Coolant Temperature (ECT) sensor -G62-, checking

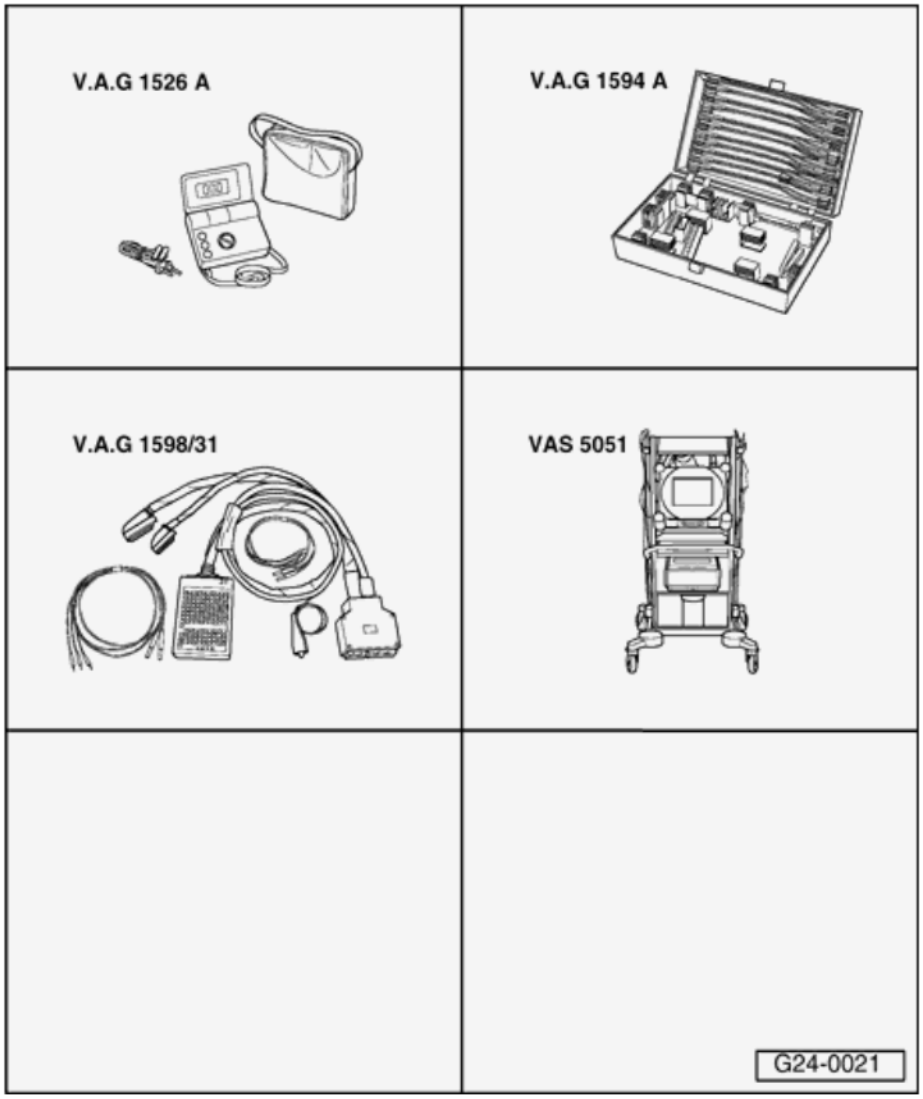

Fig. 328: Engine Coolant Temperature (ECT) Sensor -G62-, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box
- VAS 5051 Vehicle diagnostic, testing and vehicle information system with VAS 5051/1 Adapter

Component location --> **Component locations, overview**

Requirements

- Engine cold

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection. Engine must be run at idle.

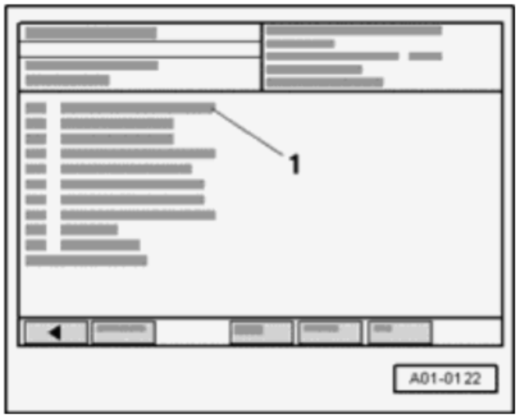

Fig. 329: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "08 - Read measured value block".

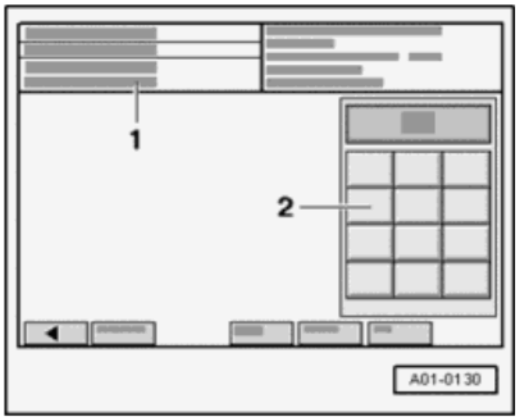

Fig. 330: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "004" for "display group number 004" in zone -2- and confirm entry by pressing -Q- button.

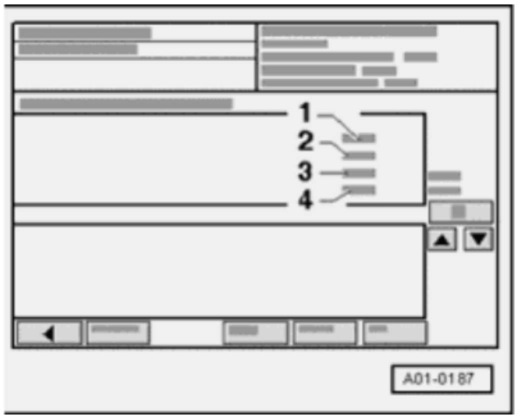

Fig. 331: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Check Engine Coolant Temperature (ECT) sensor -G62- in display zone -3-.

	Display zones			
	1	2	3	4
Display group 004: Coolant temperature with engine at idle				
Display	xxxx rpm	xx.x V	**xxx.x ° C**	xxx.x ° C
Display	Engine speed	Battery voltage	**Coolant temperature**	Intake Air Temperature (IAT)
Range			**-48.0...143.0 ° C**	

Specified value	xxxx rpm	12.0 to 15.0 volts	**The temperature reading should increase evenly**	from ambient temperature up to 110 ° C

If display zone 3 shows an implausible value:

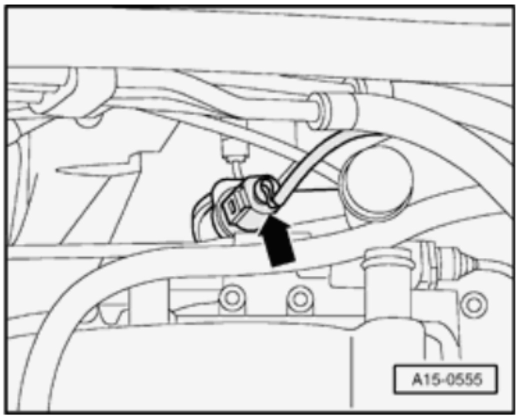

Fig. 332: Disconnecting Connector At Engine Coolant Temperature (ECT) Sensor G2/G62
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect Engine Coolant Temperature (ECT) sensor connector at -G2-/-G62- (arrow).

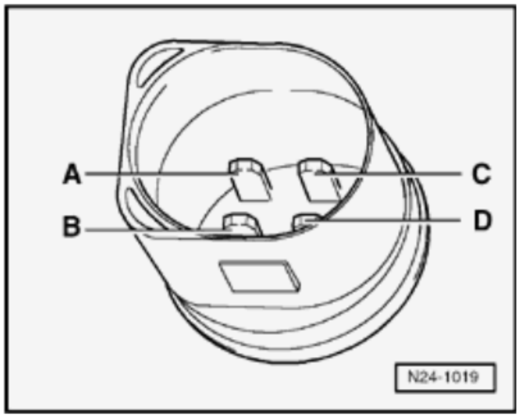

Fig. 333: Engine Coolant Temperature Sensor G62 Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter between terminals C and D of sensor to measure resistance.

Range A shows resistance values for temperature range 0...50 ° C and range B shows the values for temperature range 50...100 ° C.

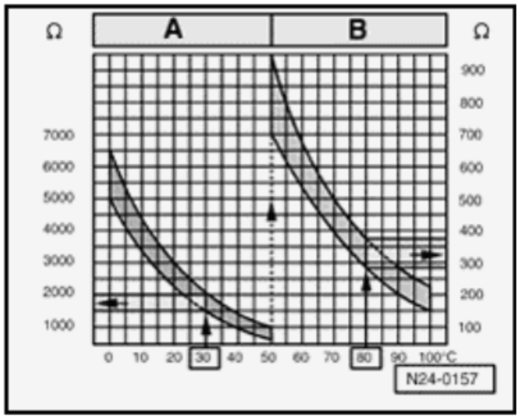

Fig. 334: Resistance Values Graph
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Sample readings:

- 30 ° C corresponds to a resistance of 1500 to 2000 ohms
- 80 ° C corresponds to a resistance of 275 to 375 ohms

If specified value is not obtained:

- Replace Engine Coolant Temperature (ECT) sensor -G62-.

If specified value is obtained:

- Connect test box V.A.G 1598/31 to wiring harness for ECM; do not connect directly to ECM. Refer to **Electrical testing using VAG1598/31 test box**.

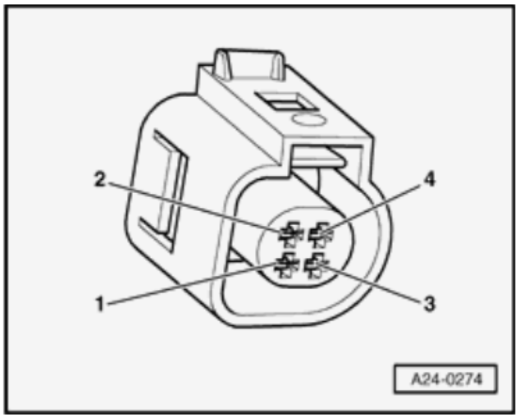

Fig. 335: Coolant Temperature Sensor Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check for open circuit, short to positive, or short to ground in following wiring connections:

Connector	Test box V.A.G 1598/31

Terminal	Socket
3	108
4 (signal)	93

- Test for short circuits between two wires.
- Repair any open/short circuit as necessary.

If no wiring problems are found:

- Replace ECM. Refer to **Engine Control Module (ECM) (without metal anti-theft housing), replacing**.

Motronic Engine Control Module (ECM) power supply, checking

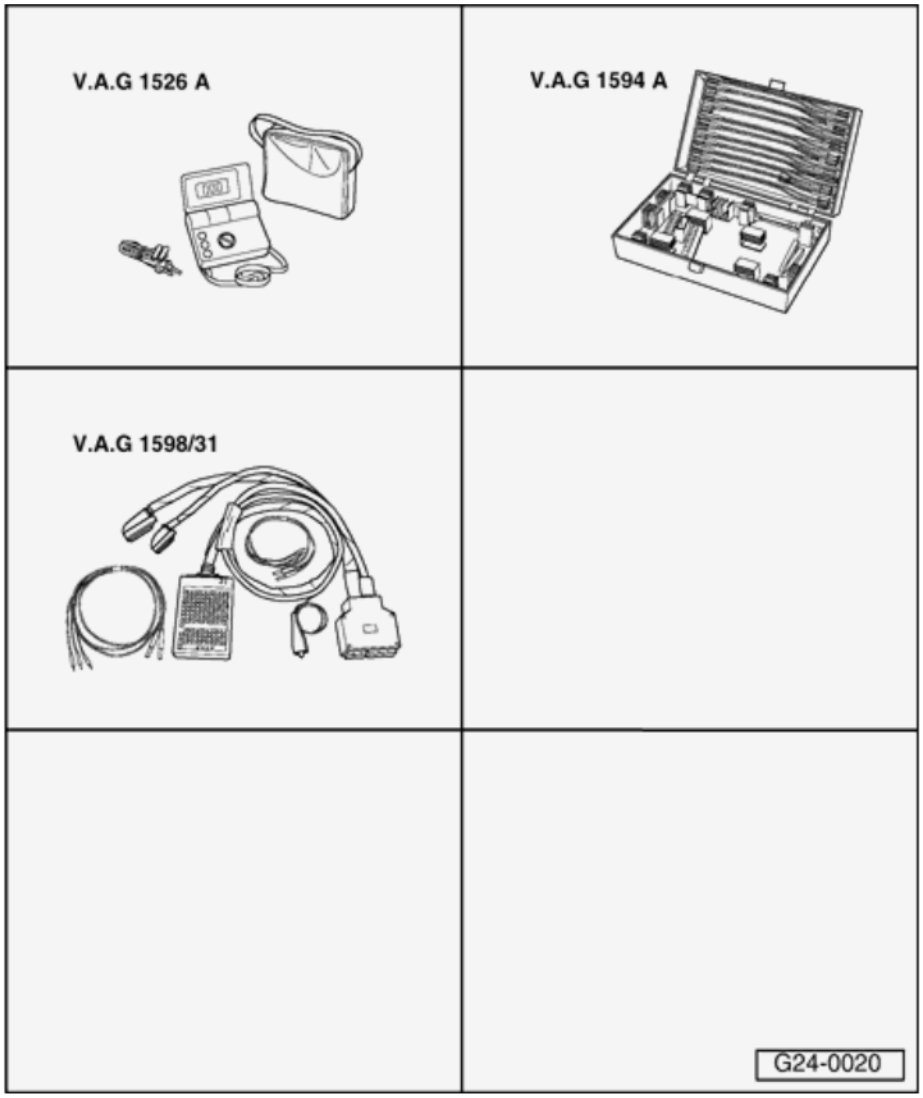

Fig. 336: Identifying Special Tools - Motronic Engine Control Module (ECM) Power Supply, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box

Requirements

- Fuses for engine electronics OK

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

- Battery voltage at least 12.7 V
- Generator OK

Work sequence

- Connect test box V.A.G 1598/31 to wiring harness for ECM; do not connect directly to ECM. Refer to **Electrical testing using VAG1598/31 test box**.
- Switch ignition on.

NOTE:

- **The positive voltage supply to the ECM is provided via terminal 3 (terminal 15) and terminal 62 (terminal 30).**
- **The ground (GND) connection to the ECM is provided via terminal 1 and terminal 2.**

- Connect multimeter as follows to measure voltage:

Test box V.A.G 1598/31 Socket	Measure to
1	Battery positive (B+)
2	Battery positive (B+)
62	Engine Ground (GND)

- Specified value: approx. battery voltage (B+)

- Connect multimeter as follows to measure voltage:

Test box V.A.G 1598/31 Socket	Measure to
3	Engine Ground (GND)

- Switch ignition on.

- Specified value: approx. battery voltage (B+)

If specified values are not obtained:

- Check wiring connections.

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

- Connect multimeter as follows to measure voltage:

Test box V.A.G 1598/31 Socket	Measure to
121 1)	Engine Ground (GND)

1) The Motronic Engine Control Module (ECM) Power Supply Relay -J271- carries voltage on terminal 121 of ECM after switching off the ignition for up to 15minutes.

- Switch ignition on.

- Specified value: approx. battery voltage (B+)

If specified value is not obtained:

- Check wiring connections.

Refer to Electrical Wiring Diagrams, Troubleshooting & Component Locations

- Check Motronic Engine Control Module (ECM) Power Supply Relay -J271-. Refer to **Motronic ECM Power supply relay -J271-, checking**.

Knock recognition control limit, checking

If a DTC relating to "knock recognition control limit reached" is made, perform the following checks:

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** and select vehicle system "01 -Engine electronics" in selection. Engine must be run at idle.

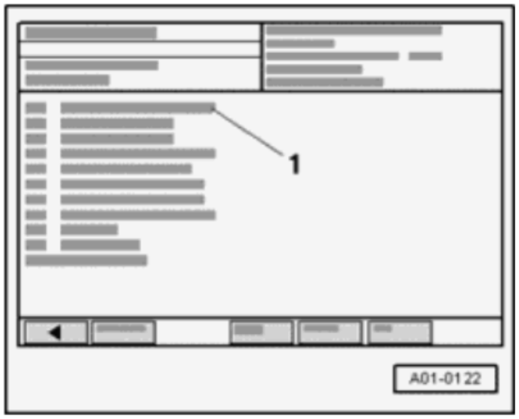

Fig. 337: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Under -1- select diagnostic function "08 - Read measured value block".

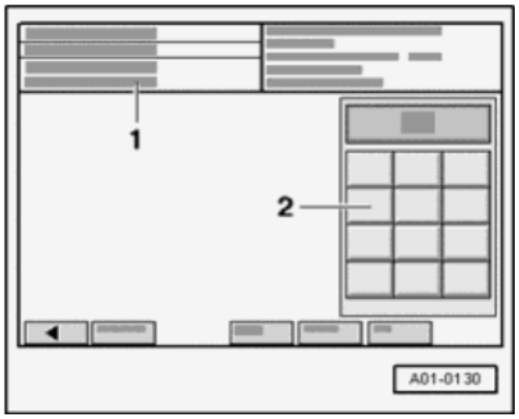

Fig. 338: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

1 - Enter display group

- Enter "020" for "display group number 020" in zone -2- and confirm entry by pressing -Q- button.

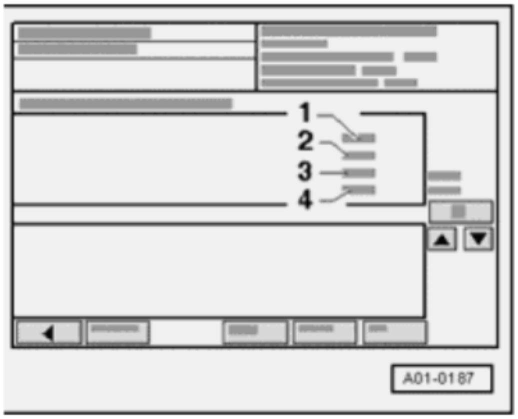

Fig. 339: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Check knock control in display zones -1- to -4-.

	Display zones			
	1	2	3	4
Display group 020: Ignition knock recognition control while driving				
Display	**xx.x ° KW**	**xx.x ° KW**	**xx.x ° KW**	**xx.x ° KW**
Display	**Ignition timing retardation by knock recognition control, cylinder 1**	**Ignition timing retardation by knock recognition control, cylinder 2**	**Ignition timing retardation by knock recognition control, cylinder 3**	**Ignition timing retardation by knock recognition control, cylinder 4**
Specified value	**0...12 ° crankshaft**	**0...12 ° crankshaft**	**0...12 ° crankshaft**	**0...12 ° crankshaft**
Evaluation. Refer to **Evaluation ignition angle retardation**				

NOTE: **The numbers displayed in display zones 1 to 4 represent the actual ignition timing retardation due to the knock control of the individual cylinders. The ignition angle retardation is carried out late in ° KW (crankshaft degree).**

- Exit function "08 - Read measured value block" by pressing <-- button.

Evaluation ignition angle retardation

Indicated on display	Possible cause	Corrective Action
All cylinders greater than 12 ° KW	• Knock sensor malfunction	○ Check knock sensor. Refer to **Knock sensors, checking**
	• Connector corroded	
	• Knock sensor incorrectly tightened	○ Loosen knock sensor and retighten to 20 Nm.
	• Loose components on	○ Secure components

	engine	
	Poor fuel quality	Changing fuel grade (see operating instructions)
One cylinder deviates significantly from the others	Connector corroded	Check knock sensor. Refer to **Knock sensors, checking**
	Engine malfunction	Check compression: Refer to **15 - ENGINE - CYLINDER HEAD, VALVETRAIN** , Compression pressure, checking
	Loose components on engine	Secure components

Knock sensors, checking

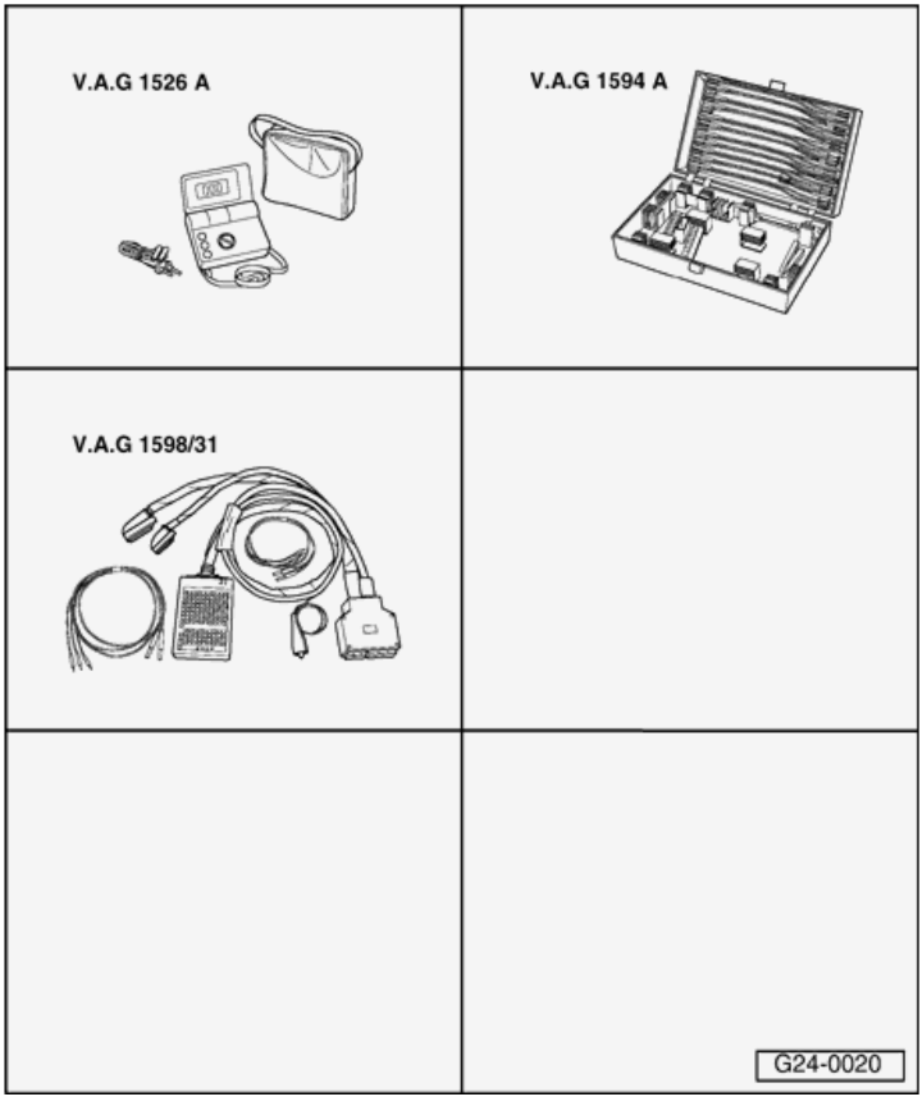

Fig. 340: Identifying Special Tools - Knock Sensors, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box

Component location --> **Component locations, overview**

NOTE:
- **The Knock sensors -G61- and -G66- cannot be tested electrically by themselves..**
- **Use only gold-plated terminals when repairing the cable connectors for the knock sensors.**

- **To ensure that the knock sensors function properly it is important to keep exactly to the specified tightening torque of 20 Nm.**
- **Check connector between knock sensor and wiring harness for corrosion.**

Checking knock sensor wiring

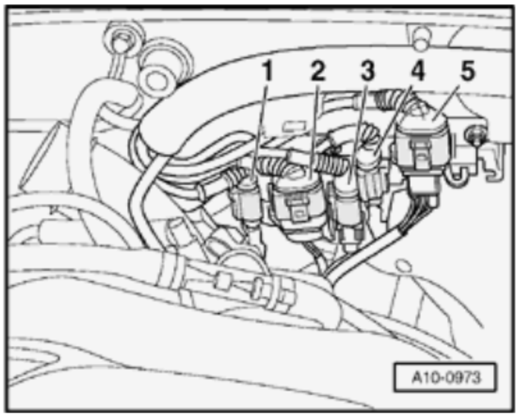

Fig. 341: Identifying Connectors For Oxygen Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect Knock sensor 1 -G61- connector -Pos. 1- or Knock sensor 2 -G66- connector -Pos. 4-.

NOTE:

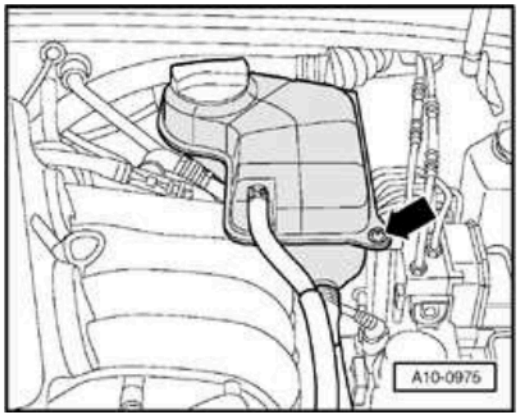

Fig. 342: Removing Coolant Expansion Tank Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

To gain access to the connector, remove coolant expansion tank bolt (arrow) and move expansion tank to the side. Fuel hoses remain connected.

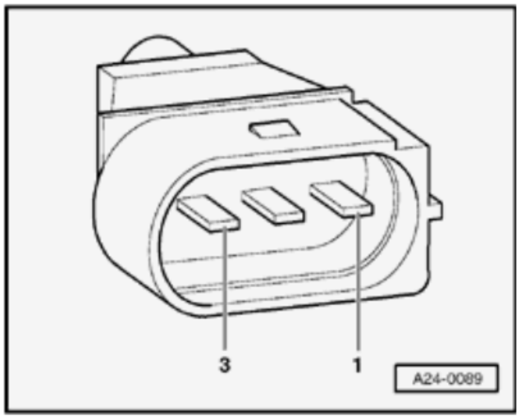

Fig. 343: 3-Pin Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Test for short between all three terminals in knock sensor connector (terminals 1+2, 1+3, 2+3).
- Specified value: infinity ohms (no continuity) wiring must not be connected to each other.
- If there is a connection between terminals, install a new knock sensor.

If no malfunction is found:

Checking wiring from knock sensors to ECM

- Connect test box V.A.G 1598/31 to wiring harness for ECM; do not connect ECM. Refer to **Electrical testing using VAG1598/31 test box**.
- Check for open circuit, short to ground, or short to positive in following wiring connections:

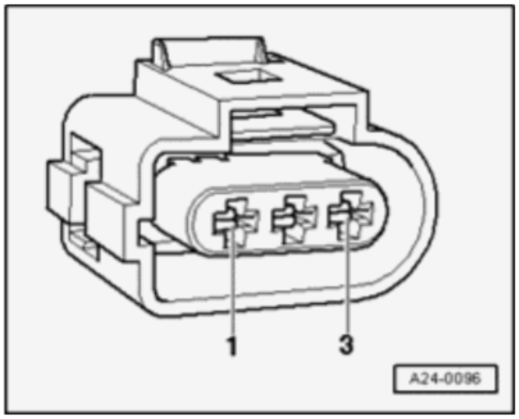

Fig. 344: Identifying 3-Pin Connector Terminals 1 & 3
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Knock sensor 1 -G61- (cylinders 1 and 2)

Connector	Test box V.A.G 1598/31

Terminal	Socket
1 (signal)	106
2 (ground)	99
3 (screening)	108

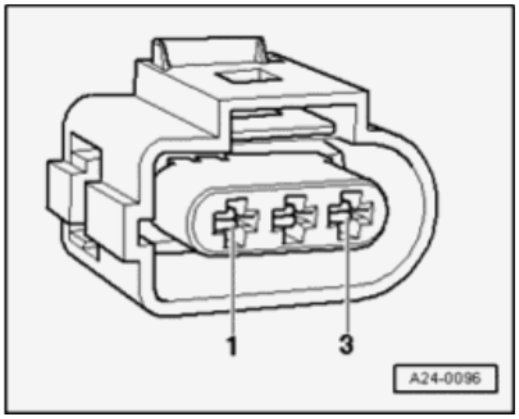

Fig. 345: Identifying 3-Pin Connector Terminals 1 & 3
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Knock sensor 2 -G66- (cylinders 3 and 4)

Connector Terminal	Test box V.A.G 1598/31 Socket
1 (signal)	107
2 (ground)	99
3 (screening)	108

  - Repair any open/short circuit as necessary.

Camshaft Position (CMP) sensor -G40-, checking

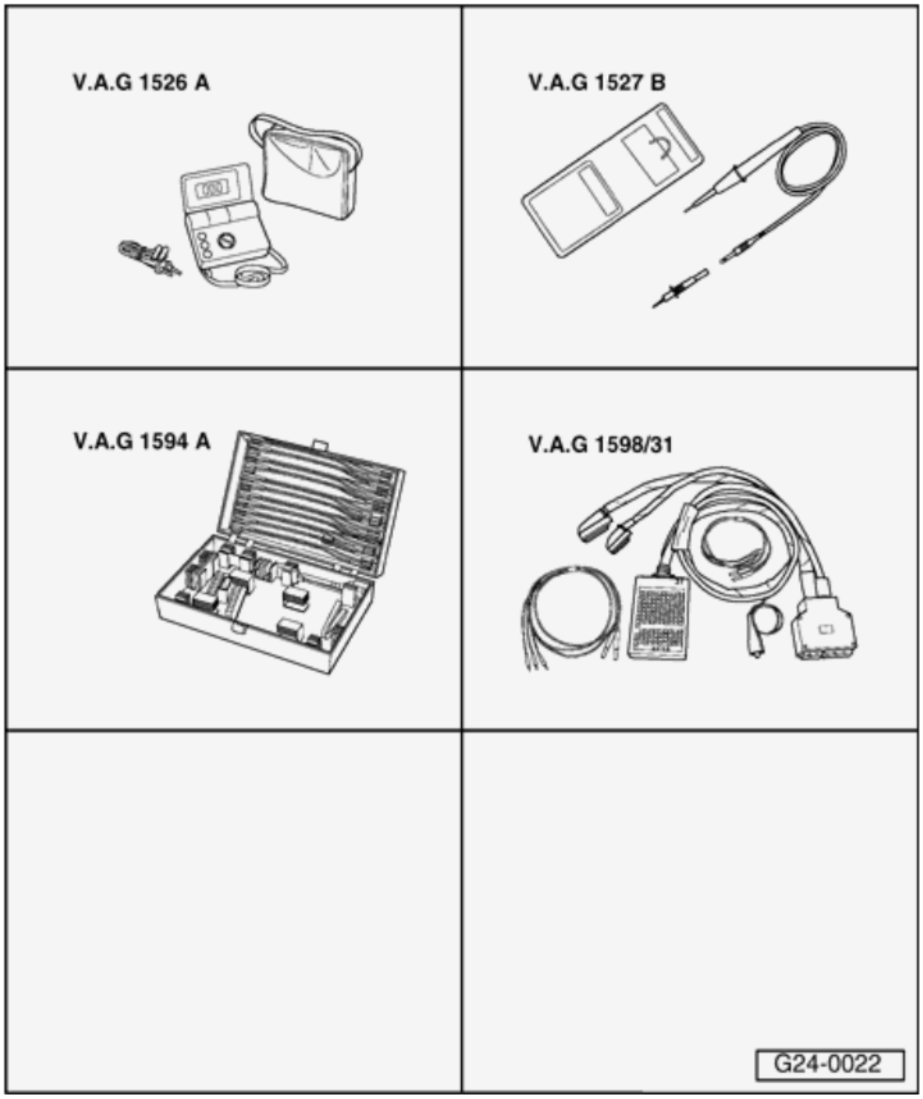

Fig. 346: Identifying Special Tools - Camshaft Position (CMP) Sensor -G40-, Checking
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Special tools and workshop equipment required

- V.A.G 1526 A Multimeter
- V.A.G 1527 B Voltage tester
- V.A.G 1594 A Connector test kit
- V.A.G 1598/31 Test box

Component location --> **Component locations, overview**

The Camshaft Position (CMP) sensor -G40- indicates the ignition position for cylinder 1.

If the Camshaft Position (CMP) sensor -G40- fails to function, the knock recognition control is switched off and the ignition timing is retarded slightly because the signals can no longer be assigned to the cylinders.

Furthermore, the charge pressure of the turbocharger is lowered.

Even without a signal from the Camshaft Position (CMP) sensor -G40-, the engine will continue to run and can also be restarted.

- When a malfunction is detected, the ECM produces one spark for each cylinder on every crankshaft revolution.
- The fact that the ECM is out of phase by one engine revolution does not have any noticeable effect on the injection system. If this happens, the fuel is injected "upstream" (before the closed intake valve) instead of while the intake valve is open. This has only a minor influence on the quality of the air/fuel mixture.

Checking activation

- Push back rubber grommet of connector for Camshaft Position (CMP) sensor -G40- back but leave connector attached.

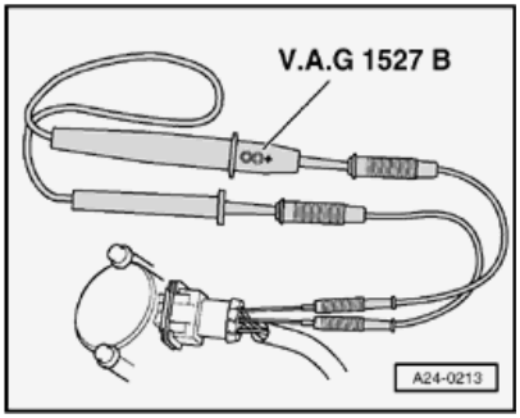

Fig. 347: VAG 1527B Voltage Tester Connected Between Sockets 2 And 1
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect LED voltage tester V.A.G 1527 B between receptacle 2 (Camshaft Position (CMP) sensor -G40- signal) and receptacle 1 (B+).

NOTE: Receptacles are numbered accordingly on the back of the connector.

- Operate starter for a few seconds.

- LED must flash.

NOTE: LED voltage testers with a low current consumption continue to glow faintly between activation from the ECM (rather than extinguishing completely) and become much brighter when activated.

If LED does not flash:

Checking power supply

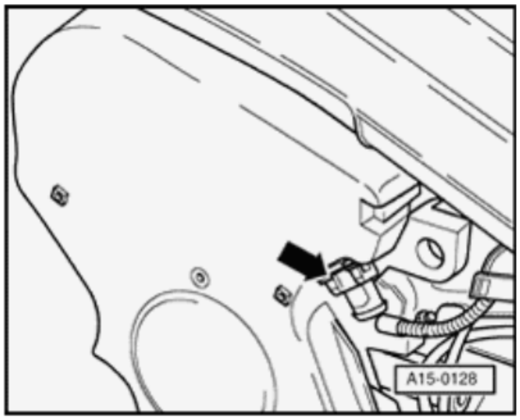

Fig. 348: Locating Connector At Camshaft Position Sensor G40
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect Camshaft Position (CMP) sensor -G40- connector (arrow).

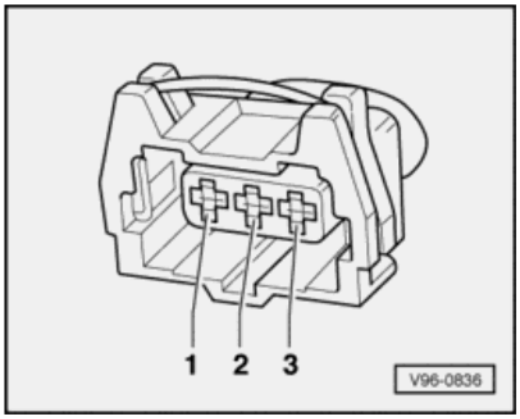

Fig. 349: Identifying 3 Pin Electrical Harness Connector Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter as follows to measure voltage:

Connector Terminal	Measure to
1	Engine ground (GND)

- Switch ignition on.
- Specified value: approx. 5 V

Checking signal wire

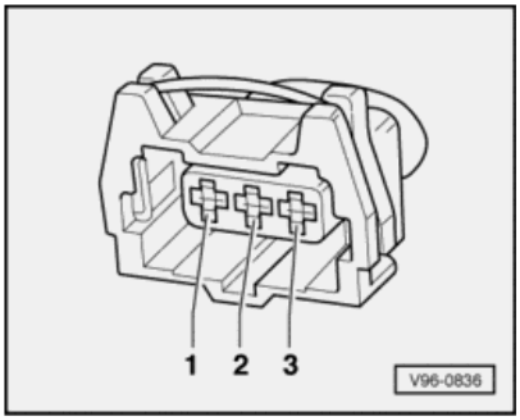

Fig. 350: Identifying 3 Pin Electrical Harness Connector Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect multimeter as follows to measure voltage:

Connector Terminal	Measure to
2	Engine Ground (GND)

- Switch ignition on.
- Specified value: approx. battery voltage (B+)

Checking Ground (GND) wire

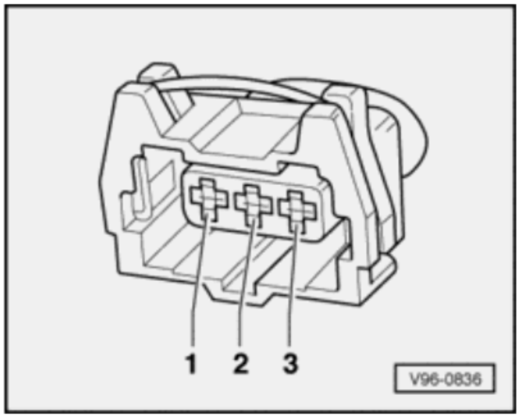

Fig. 351: Identifying 3 Pin Electrical Harness Connector Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check for open circuit, short to positive, or short to ground in following wiring connections:

Connector Terminal	Measure to
3	Engine Ground (GND)

- Repair any open/short circuit as necessary.

If the specified values are all achieved and the LED voltage tester does not flash (measured between terminals 1 and 2 with starter connector attached),

- Install a new Camshaft Position (CMP) sensor -G40-..

If specified values are not obtained:

Checking wiring between Camshaft Position (CMP) sensor -G40- and ECM

- Connect test box V.A.G 1598/31 to wiring harness for ECM; do not connect directly to ECM. Refer to **Electrical testing using VAG1598/31 test box**.

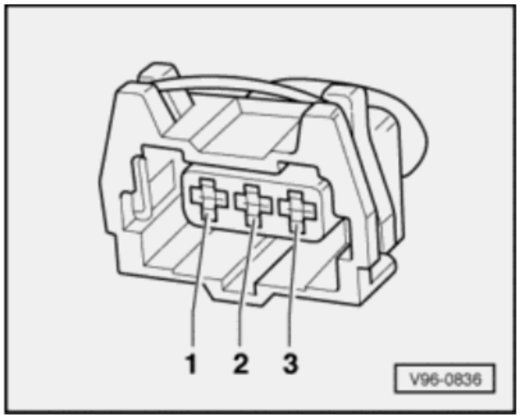

Fig. 352: Identifying 3 Pin Electrical Harness Connector Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Check for open circuit, short to positive, or short to ground in following wiring connections:

Connector Terminal	Test box V.A.G 1598/31 Socket
1 (B+)	98
2 (signal)	86
3 (ground)	108

- Repair any open/short circuit as necessary.

If a trial erasure of the DTC memory is followed by the replaced indication of a malfunction relating to the Camshaft Position (CMP) sensor -G40- although all previous tests were OK, the following malfunctions are possible:

- Rotor ring for Camshaft Position (CMP) sensor -G40- misaligned
  - Unbolt Camshaft Position (CMP) sensor -G40- and ensure that rotor ring is correctly aligned on camshaft

(if it is incorrectly installed, catch will be pressed flat when securing screw is tightened).

- If position of rotor ring is OK, check position of camshaft in relation to crankshaft.

Refer to **15 - ENGINE - CYLINDER HEAD, VALVETRAIN**

Misfire recognition, checking

Special tools and equipment

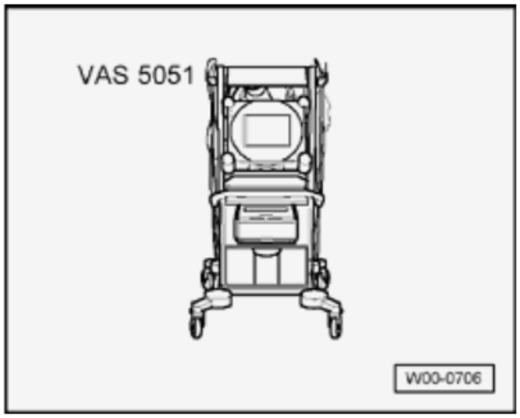

Fig. 353: Identifying Vehicle Diagnosis, Testing And Information System VAS 5051
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- VAS 5051 with VAS 5051/1

Work sequence

- Connect Vehicle Diagnostic, Testing and Information System VAS 5051 or VAG 1551. Refer to **VAS 5051 vehicle diagnostic, testing and information system, connecting and selecting functions** tester and select control module for engine electronics 1 by inserting address word 01. Engine must be running at idle for this test.

Rapid data transfer HELP Select function XX

Indicated on display

- Press buttons -0- and -8- to select "Read Measuring Value Block" function 08 and press Q button to confirm input.

Read Measuring Value Block Q Input display group number XXX

Indicated on display

- Press buttons -0-, -1- and -4- to input "display group number 14" and press Q button to confirm input.

```
Read Measuring Value Block 14 -->
1 2 3 4
```

Indicated on display

- Check misfire detection.

	Display zones			
	1	2	3	4
Display group 014: Misfire recognition				
Display	xxx rpm	xxx %	**xxx**	**---**
Display	Engine speed	Load	**Total misfire**	**Misfire recognition**
Range	min.: 550 RPM max.: 7200 RPM	min.: 0 max.: 100		**Activated** **Not activated**
Specified value	600 to 820 rpm	xx.x %	**0 to 5**	**Activated**
---	---	If the specified value is not reached: Evaluation display field 3. Refer to **Evaluating display groups 014, 015 and 016, Display field 3:**	---	

If specified value is reached:

- Press --> button.

```
Rapid data transfer HELP
Select function XX
```

Indicated on display (function selection):

If specified value is not obtained:

- To switch to display group 015 press s button.

Checking misfire recognition of the individual cylinder

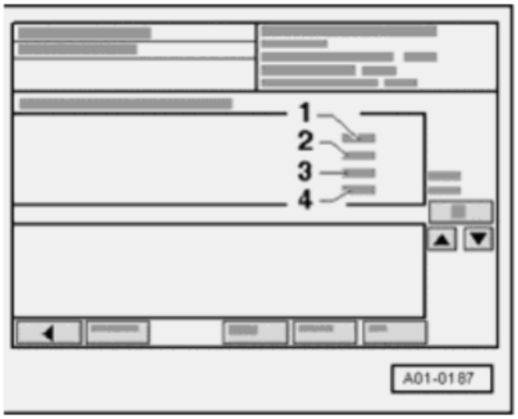

Fig. 354: Diagnostic System VAS 5051: Display
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Check misfire recognition in display zones -1- to -4-.

	Display zones			
	1	2	3	4
Display group 015: Misfire recognition of cylinders 1, 2 and 3				
Display	**xxx**	**xxx**	**xxx**	**---**
Display	**Number of misfires in cylinder 1**	**Number of misfires in cylinder 2**	**Number of misfires in cylinder 3**	**Misfire recognition**
Range				**Activated** **Not activated**
Specified value	**0**	**0**	**0**	**Activated**
If nominal value is exceeded: Evaluation. Refer to **Evaluating display groups 014, 015 and 016, Display field 3:**				**---**

- To switch to display group 016 press [Back Arrow] button.

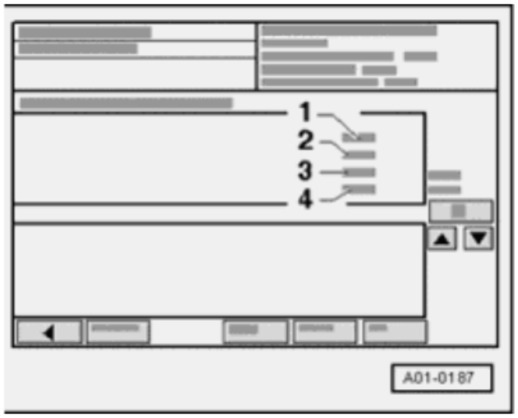

Fig. 355: Diagnostic System VAS 5051: Display

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display on VAS 5051:

- Check misfire detection in display zones -1- and -4-.

	Display zones			
	1	2	3	4
Display group 016: Misfire recognition of cylinder 4.				
Display	**xxx**			**---**
Display	**Number of misfires in cylinder 4**			**Misfire recognition**
Range				**Activated** **Activated**
Specified value	**0**			**Activated**
If nominal value is exceeded: Evaluation. Refer to **Evaluating display groups 014, 015 and 016, Display field 3:**				**---**

- Exit function "08 - Read measured value block" by pressing <-- button.

Evaluating display groups 014, 015 and 016, Display field 3:

Display field: 3	**Possible cause**	**Corrective action**
Greater than 5	• Faulty spark plug • Faulty spark plug connector • Ignition coil or output stage malfunction	○ Check spark plugs and ignition wires with connector. ○ Check ignition coils with output stages. Refer to **Ignition coils with power output stages, checking**
	• Injector faulty	○ Check fuel injectors. Refer to **Fuel injectors, checking**
	• Crankcase housing leaking • Check compression	○ Check hose setup of crankcase ventilation for secure seating and for proper seal.